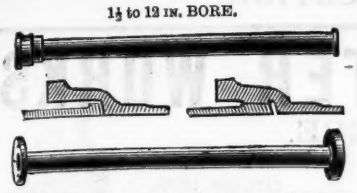
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVI. No. 1696.] LONDON, NOVEMBER 12, 1895. [47TH YEAR. PRICE 6d.

GAS AND WATER PIPES
1½ to 12 IN. BORE.



THOMAS ALLAN & SONS,
Bonlea Foundry,
SOUTH STOCKTON-ON-TEES.
Formerly Springbank Iron-Works, Glasgow.
ESTABLISHED 1848.
ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.
Telegrams: "BONLEA, STOCKTON-ON-TEES."

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL
AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.

"BEAR CREEK" CANNEL.
LOG MOUNTAIN COAL, COKE, AND TIMBER CO.,
PINEVILLE, KENTUCKY, U.S.A.
Cable Address: "Hull, Pineville."
LONDON AGENTS:
W. J. WILSON & CO., Suffolk House, Cannon St., E.C.

THE ALLIANCE METER COMPANY, LTD.

WET & DRY GAS-METERS.

FREE SAMPLES
for Inspection
and Test sent
Carriage Paid.

These Meters, manufactured at the Company's Factories in the United States of America, are of superior quality and workmanship, and contain many valuable Improvements, which render them less liable to derangement than any other Meters.

They will not allow the smallest quantity of Gas to pass without being registered, and are warranted to register correctly, and not to vary with different pressures.

THE ALLIANCE METER COMPANY, Ltd., 9, London Street, London, E.C.

SAWER & PURVES, Garratt St. Works, MANCHESTER,

MANUFACTURERS OF

IMPROVED WET GAS-METERS IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

IMPROVED DRY GAS-METERS.

Speciality: PATENT CASH PREPAYMENT METERS.

CATALOGUE SENT ON APPLICATION.

PUMPS FOR GAS & WATER WORKS.

FIRST AWARDS EVERYWHERE.

TELEGRAMS: "EVANS WOLVERHAMPTON."

LATEST HIGHEST AWARD, TASMANIA, 1895.
"Special" First-Class Certificate.

APPLY FOR CATALOGUE NO. 8.

TRADE MARK.

(No Tappets.)

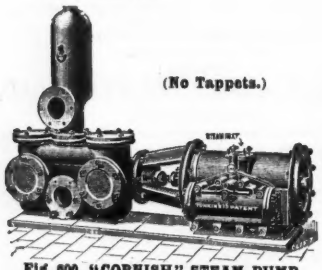


Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

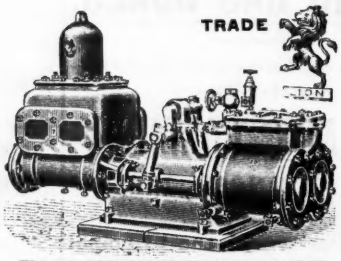


Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

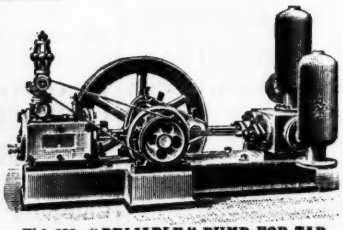


Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

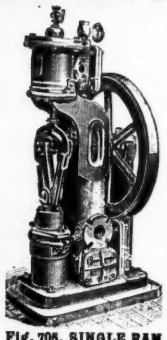


Fig. 708. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

JOSEPH EVANS & SONS, Hydraulic Engineers,

WOLVERHAMPTON. LONDON OFFICE: 16, Union Court, Old Broad Street, E.C.

FALK, STADELMANN, & CO., LTD.,

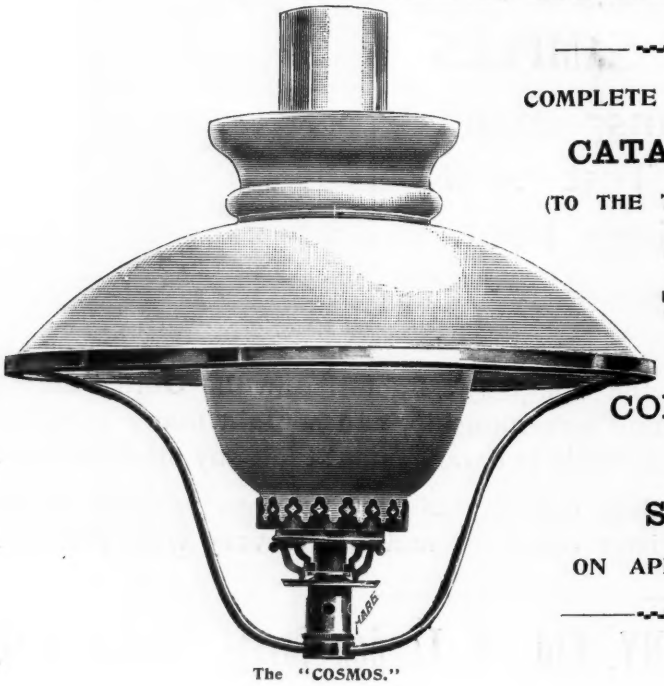
Veritas Lamp Works, 83, 85, & 87, FARRINGDON ROAD, LONDON, E.C.,

Wholesale Agents for the

INCANDESCENT GAS-LIGHT CO.,

(WELSBACH SYSTEM)

FOR ENGLAND, SCOTLAND, AND WALES.



The "COSMOS."

COMPLETE ILLUSTRATED

CATALOGUE

(TO THE TRADE ONLY),

AND

TERMS

AND

CONDITIONS

OF

SALE,

ON APPLICATION.

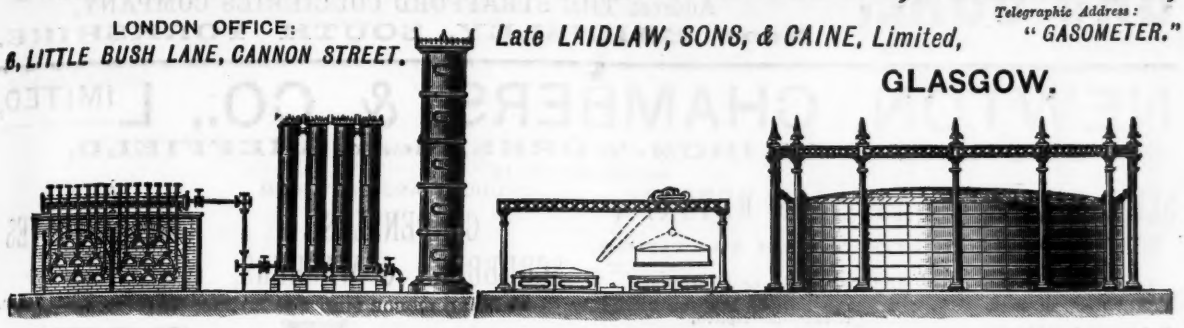
The "CAMBRIDGE."

THE BARROWFIELD IRON-WORKS, LIMITED,

LONDON OFFICE:
6, LITTLE BUSH LANE, CANNON STREET.

Late LAIDLAW, SONS, & CAINE, Limited,
GLASGOW.

Telegraphic Address:
"GASOMETER."



MANUFACTURERS OF ALL KINDS OF GAS PLANT.

RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
CONDENSERS, EXHAUSTERS, AND ENGINES; SCRUBBERS, WASHERS;
PURIFIERS, WITH PLANED AND CEMENT JOINTS;
DRY AND HYDRAULIC CENTRE-VALVES;
HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
GASHOLDERS, SINGLE-LIFT & TELESCOPE; CAST & WROUGHT-IRON TANKS;
STATION METERS; GOVERNORS; SCREW AND RACK VALVES;
FOUR-WAY COCKS AND HYDRAULIC VALVES;
CAST-IRON GAS, WATER, & STEAM PIPES & CONNECTIONS; WROUGHT-IRON TUBES & FITTINGS;
IRON ROOFING, MARKET BUILDINGS, BRIDGES, GIRDERS, STEAM BOILERS;
PROMENADE PIERS AND LOADING WHARVES.

MANUFACTURERS OF OIL PLANT OF EVERY DESCRIPTION.

HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c.

DESCRIPTIVE SPECIFICATIONS AND ESTIMATES ON APPLICATION.

W. H. ALLEN & CO.,

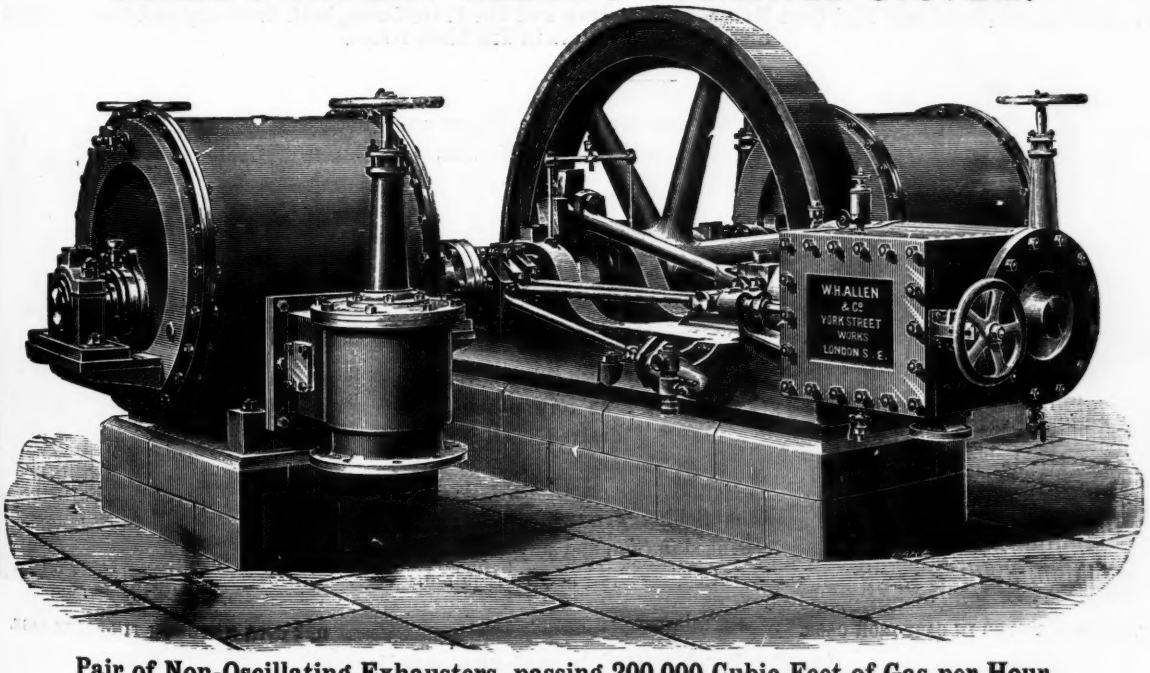
YORK STREET WORKS, LAMBETH, LONDON, S.E.,

And of QUEEN'S ENGINEERING WORKS, BEDFORD,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.



Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL,
Address THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

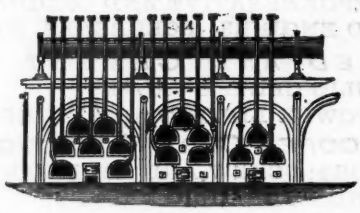
NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES,
WITH RACK & PINION
OR
Internal or External
SCREWS of all sizes.
GASHOLDERS,
AND
Gasholder Tanks.

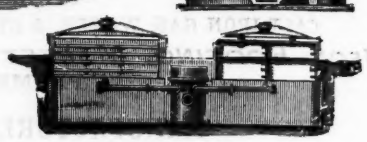
CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description,
Iron Roofs, Columns, Girders, Floor Plates,
Tools, &c.



WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.

PATENT
CENTRE-VALVES
for working Purifiers,
Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS.
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

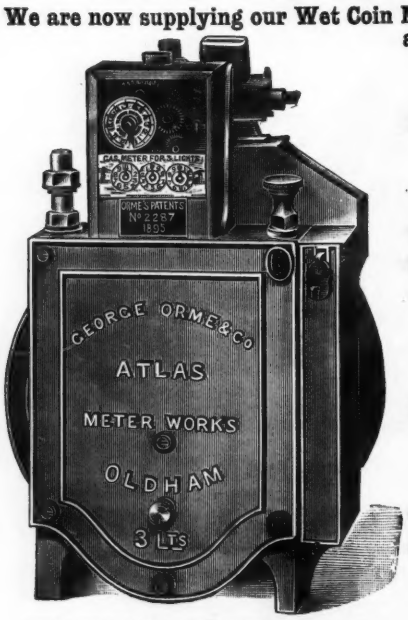
GEORGE ORME & CO.

ATLAS METER WORKS, OLDHAM.

Manufacturers of

ORME'S PATENT IMPROVED COIN METER.

We are now supplying our Wet Coin Meters in Cast-Iron and Tin-Plate Cases, both Ordinary and Compensating; also Dry Coin Meters in Tin-Plate Cases.



WET COIN METER IN CAST-IRON CASE.

A large number of these Meters are in use, and giving satisfaction.

The Mechanism is very simple; and there are no springs or complicated parts to get out of order.

We supply them to work with **1d., 1s., or any other Coin desired.**

The Selling Price of Gas can be changed *in Situ*, and any number of feet delivered, as may be required.

DRY COIN METER IN TIN-PLATE CASE.

Any further Particulars sent upon application.

Telegraphic Address: "ORME, OLDHAM." Telephone: No. 93, Oldham.

BRAY'S PATENT "ENAMEL"

GAS-BURNERS

BRAY'S

"SPECIAL" & "ADJUSTABLE" BURNERS

Are the Best for General Use, and will, at their

REDUCED PRICE,

Save their Cost in Gas alone in Forty Hours' use.

The "Adjustables" are specially adapted for use with Penny-in-the-Slot Meters, for which purpose large quantities have been sold.

THE "CODAC" ECONOMISER.

Ordinary Regulator Burner with "Codac" Top on.

A cheap adaptation of Bray's "ADJUSTABLE" BURNER, not so efficient, but acceptable for some purposes. The top part only is required, and is made merely to slip on to our ordinary Regulator Burners, which are in use throughout the world. Made in Union Jets and Batswings.

Ordinary Regulator Burner with "Codac" Top on.

SEND FOR PRICE LIST AND CATALOGUE.

GEO. BRAY & Co., Gas-Lighting Engineers, LEEDS.

WE HAVE ACQUIRED

NEW ENGINEERING

IRON, STEEL, AND METAL WORKS

IN THE HEART OF THE MOST

Central and Cheapest

Coal and Iron Districts, and have made them complete with a full equipment of

Specially Designed Tools and Appliances,

FOR THE

ECONOMICAL AND EFFICIENT

PRODUCTION OF OUR

World-Famed Specialities.

ADDRESS ALL COMMUNICATIONS TO OUR HEAD OFFICE:

New CONVEYOR COY. Ld.

Gas and Mechanical Engineers,

3 & 4, LIME STREET SQUARE, LONDON, E.C.

WEST'S GAS IMPROVEMENT COMPANY, LTD.,

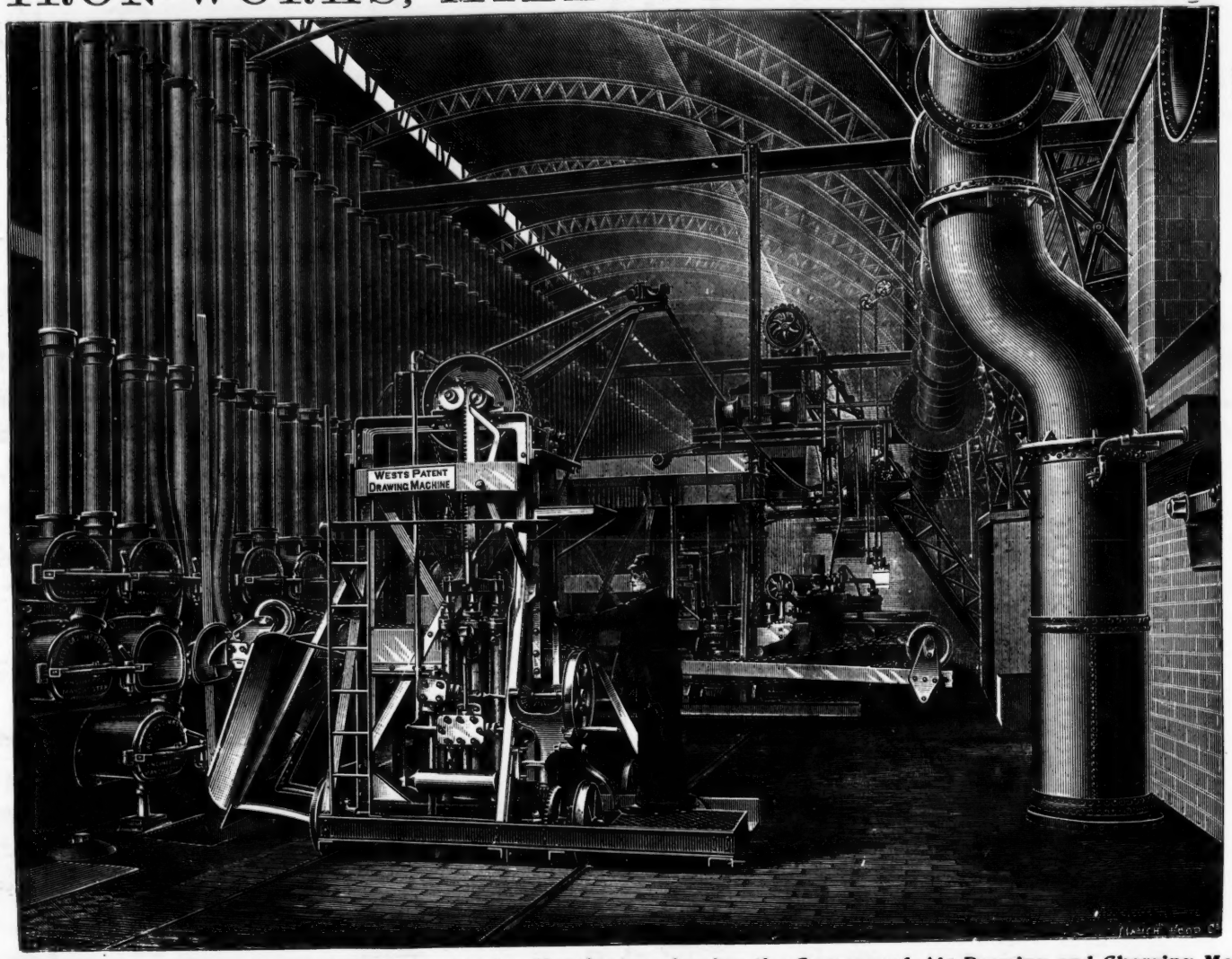
ALBION IRON-WORKS, MILES PLATTING MANCHESTER.

AND

104, Queen Victoria St.,

LONDON, E.C.

WEST'S MANUAL AND POWER MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.



Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

AND

104, Queen Victoria St.,

LONDON, E.C.

OVER

560,000

LINEAL FEET

OF

RETORTS

DAILY

ARE CHARGED AND DRAWN BY

WEST'S MACHINES.

ALL TELESCOPE HOLDERS SHOULD BE FITTED

WITH

CUTLER'S PATENT FREEZING PREVENTER

WHICH HAS BEEN FITTED TO MANY OF THE LARGEST GASHOLDERS IN LONDON AND THE PROVINCES, AND IN AUSTRIA, GERMANY, DENMARK, AND THE UNITED STATES.

Full Particulars and Prices from S. CUTLER & SONS, MILLWALL, LONDON.

THE WIRRAL ENGINEERING COMPANY, LTD.

Patent New Prepayment Meters.

WET.

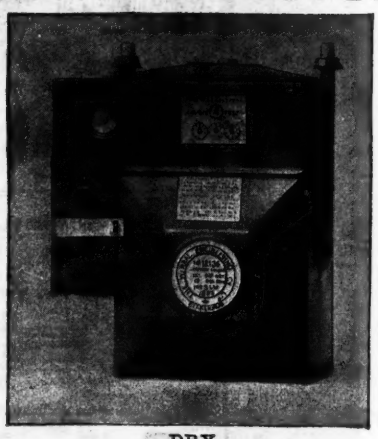
THE

"PERFECT"

AUTOMATIC.

Simple! Positive!! Accurate!!!

The only Prepayment Meter with no Springs, Counter-Balance Weights, or Frictional Gearing to get out of order.



DRY.

Particulars on Application to the COMPANY, 76, Hamilton Street, BIRKENHEAD.

WIRE-ROPE HOLDERS.

Engineers and others visiting any of the below-mentioned places should not fail to examine these most interesting examples of Engineering, illustrating modern practice in Gasholder Construction :—

NOTTINGHAM (Eastcroft Works, Four Holders), MANCHESTER (Rochdale Road Works, One Holder, Gaythorn, Three Holders), HASLINGDEN, BIRKENHEAD, BARROW-IN-FURNESS, SLIGO, DARLINGTON, TYNE DOCKS, MIDDLESBROUGH, NEWBURN STEEL-WORKS, SELBY, SOUTHBOROUGH, ST. AUSTELL (Cornwall), MILAN (Italy), ATHENS (Greece), HORSENS (Denmark), BATHURST (New South Wales), CAPE TOWN (South Africa).

For Particulars, apply to Makers and Inventors—

ASHMORE, BENSON, PEASE, & CO., LIMITED,

Gas-Works Contractors,

STOCKTON-ON-TEES.

IMPROVEMENTS IN STREET LIGHTING.
HIGHEST EFFICIENCY WITH GREATEST ECONOMY.

LIGHTING AUTHORITIES, GAS ENGINEERS, & GAS MANAGERS

Are invited to inspect the

INCANDESCENT GAS-LIGHT

Which has now been successfully adapted to the purposes of

STREET LIGHTING,

THE DIFFICULTIES CAUSED BY VIBRATION HAVING BEEN OVERCOME BY THE USE OF A SPECIAL BURNER, WHICH GIVES HIGHLY SATISFACTORY RESULTS.

This System of Lighting meets the Requirements of all the Lighting Authorities in those Districts where it is desired to effect an Improvement in Street Lighting, without any increase of expenditure.

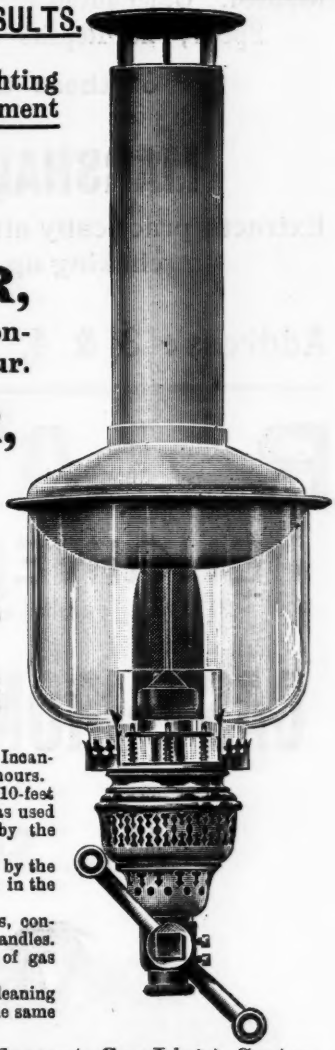
Two forms of Burners are specially recommended for Street Lighting:—

The "C" BURNER,

Giving a Light of 60 Candles, with a Consumption of 3½ Cubic Feet of Gas an Hour.

The "S" BURNER,

Giving a Light of 25 to 30 Candles, with a Consumption of 2¼ Feet of Gas an Hour.



The INCANDESCENT GAS-LIGHT has been tried with most satisfactory results for Street Lighting purposes in many Towns throughout the United Kingdom.

The Lighting Engineer of the Kensington Vestry, in a report dated the 14th of May, 1895, addressed the Works and Sanitary Committee as follows:—

(1) During the months of January, February, and March, 1895, 31 Incandescent Gas-Lamps were in use for an average period of 1167·89 hours. The estimated quantity of gas that would have been consumed by the 10-feet flat-flame burner was 11,678 cubic feet. The actual quantity of gas used by the Incandescent Gas-Light Company's Burners, as recorded by the meters, was 4415 cubic feet.

After allowing for the extra cost of up-keep, the gain to the Vestry by the use of these burners was £20 3s. 4¾d., and a large increase in the Illumination of the Street.

(2) The illuminating power given by the Incandescent Gas-Burners, consuming 3·78 cubic feet of gas per hour, was found to be equal to 60 candles. That given by the flat-flame burners, consuming 10 cubic feet of gas per hour, was 26 candles.

The lanterns fitted with Incandescent Burners only require cleaning 9 times in 90 days, as compared with 26 times' cleaning in the same period required by the lanterns fitted with flat-flame burners.

The net result therefore appears to be that, by the use of the Incandescent Gas-Light System, the saving effected is over 50s. per annum per lamp, and at the same time more than double the light is obtained. It must be noted, however, that these results were obtained with the ordinary burners, and not with the improved burners with the anti-vibration springs. With the latter, the expense of up-keep would be materially reduced, and the saving consequently increased.

For further Particulars, apply to

THE INCANDESCENT GAS-LIGHT COMPANY, LTD.,

PALMER STREET, WESTMINSTER, LONDON, S.W.

KIRKHAM, HULETT, & CHANDLER, LD.

PATENT "STANDARD" WASHER-SCRUBBER

504 of these Machines (capable of dealing with **491,150,000** cubic feet of gas per day) in use and in course of construction, which fact is given as evidence of this apparatus being the most efficient of any in the Market for the Extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.

MARSHALL'S PATENT BATTERY CONDENSER & SCRUBBER.

This Apparatus being made in Sections, the Capacity can be easily and cheaply increased as required. Other advantages are: Large and Effective Cooling Area on small Ground Space; Slow Speed; no Repairs required; High Strength Liquor obtained; and Easy Control.

Six of these Condensers in course of construction and erection.

MARSHALL'S PATENT TAR-EXTRACTOR.

Extracts practically all the Tar, and, experience proves, keeps clean and free from choking up. In use at Ilford, Antwerp, Copenhagen, &c., &c.

Address: 3 & 4, Palace Chambers, Bridge Street, Westminster.

R. LAIDLAW & SON,

ENGINEERS & IRONFOUNDERS,

CAST-IRON PIPES

ALL SIZES.

MANUFACTURERS OF

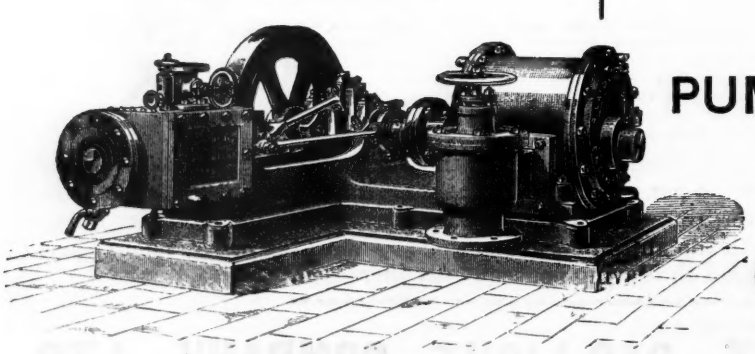
STEAM-ENGINES,

EXHAUSTERS,

VALVES,

AND

PUMPING-ENGINES.



BEALE'S GAS EXHAUSTER AND ENGINE COMBINED. ALL SIZES.

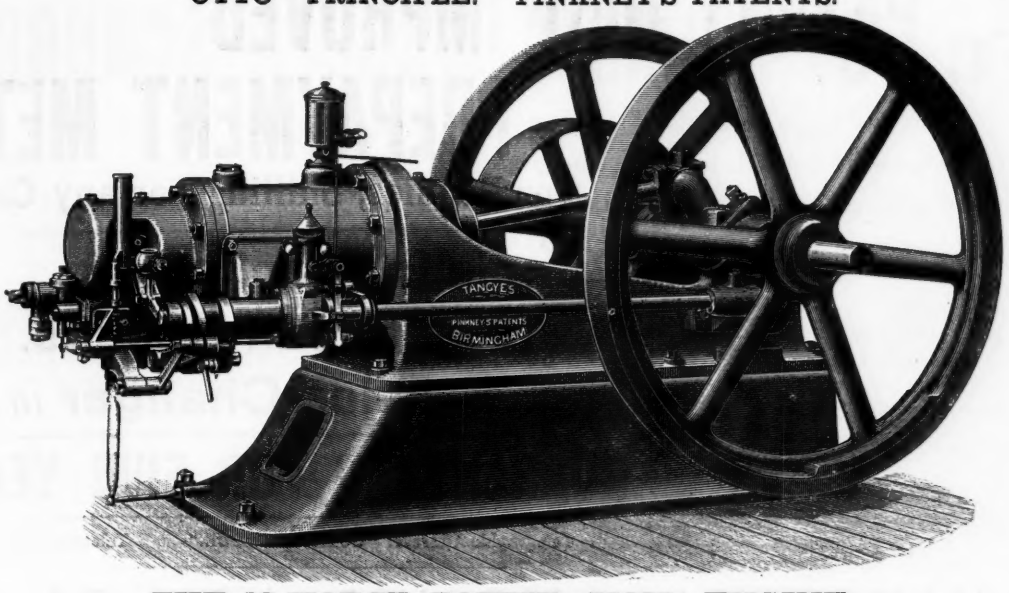
ALL KINDS OF

GAS AND WATER APPARATUS.

ALLIANCE FOUNDRY, GLASGOW. | SIMON SQUARE WORKS, EDINBURGH. | 6, LITTLE BUSH LANE, LONDON, E.C.

TANGYES GAS-ENGINE

"OTTO" PRINCIPLE. PINKNEY'S PATENTS.



THE 12-HORSE POWER (NOM.) ENGINE.

ENGINES OF ALL SIZES.

TANGYES LIMITED, BIRMINGHAM;

AND AT

LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, JOHANNESBURG, BILBAO, ROTTERDAM, and BELFAST.

Telegrams: "TANGYES, BIRMINGHAM." No. 98 E.

THE WHESSOE FOUNDRY CO., LTD., DARLINGTON.

Established 1790.

MANUFACTURERS OF EVERY DESCRIPTION OF GAS PLANT,

FROM

RETORTS

TO

GASHOLDERS

FOR WHICH THEY HAVE THE NEWEST AND MOST MODERN MACHINERY.

GASHOLDERS CAN BE MADE OF ANY DIAMETER AND PUT TOGETHER AT THE WORKS.

Holders having a capacity of **8,000,000** Cubic Feet have been made and erected; the largest one being 181 feet diameter by 136 feet 9 inches deep. Riveted entirely with ⅞-inch diameter Hot Rivets.

WE ERECT GASHOLDERS EITHER WITH OR WITHOUT FRAMING.

NO ROYALTIES TO PAY FOR PATENTS.

SOLE MAKERS OF

COATES' IMPROVED PATENT FURNACE DOOR PROTECTOR,

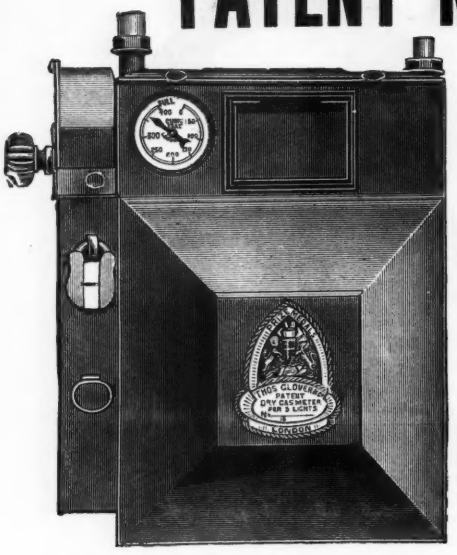
Which has been approved and adopted by the Gas Authorities at

SALFORD, MANCHESTER, BIRKENHEAD, STOCKTON, NEWCASTLE, DARLINGTON, &c.

Telegraphic Addresses: "WHESSOE, DARLINGTON." "WHESSOE, LONDON." | T. COATES, MANAGING DIRECTOR. | WORKS: DARLINGTON. LONDON OFFICE: 28, QUEEN STREET, E.C.

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER



For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

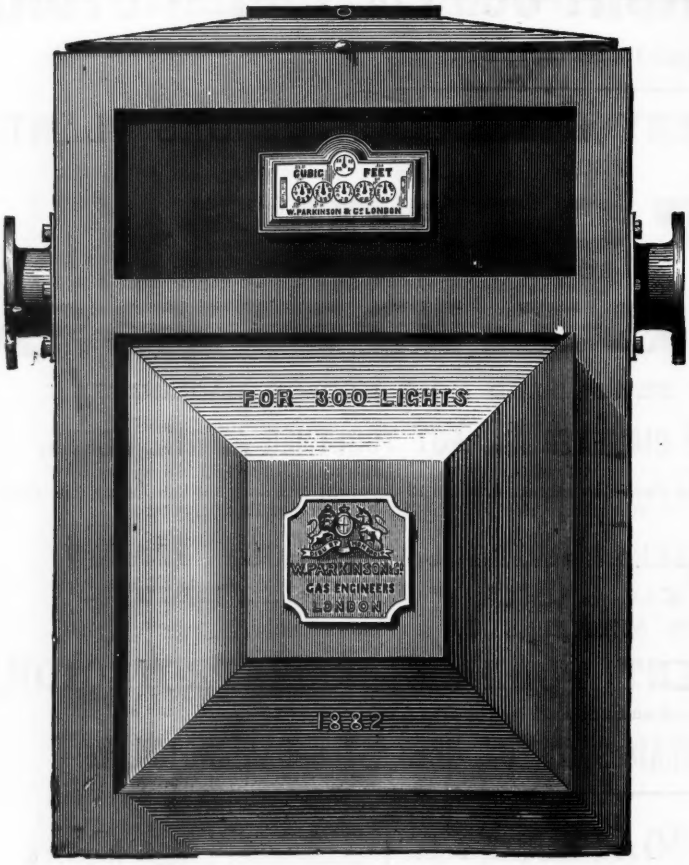
THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL:	BIRMINGHAM:	MANCHESTER:
62, VICTORIA STREET.	3, BRIDGE ROW, DERITEND.	37, BLACKFRIARS STREET.
Telegraphic Address: "GOTHIC."	*Telegraphic Address: "GOTHIC."*	*Telegraphic Address: "GOTHIC."*

W. PARKINSON & Co.



MANUFACTURERS OF

DRY METERS

OF THE VERY BEST QUALITY.

The **DIAPHRAGMS** are of the Finest PERSIAN SHEEP SKINS.

The **CASES** are of the Best CHARCOAL-TINNED PLATES.

WET METERS,

With PATENT THREE-PARTITION DRUMS.

STATION METERS AND GOVERNORS,

PRESSURE & EXHAUST REGISTERS,

MOTIVE POWER METERS,

Test Gasholders, Experimental Apparatus, &c.

PRESSURE-GAUGES OF EVERY DESCRIPTION.

NEW ILLUSTRATED CATALOGUE AND PRICE LIST
Sent post free on application.

COTTAGE LANE WORKS, CITY ROAD,

LONDON.

Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,

BIRMINGHAM.

Telegraphic Address: "GAS METERS."

CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

The Belfast and Clyde Strike and Lock-Out 965
The Curious Case of the Hertford Gas Company 966
The Imperial Continental Gas Association and Sir Julian Goldsmid . . . 966
Who is Responsible for the Proper Care of Highways? 966
Gas Residuals and "Rings" 967
A Banker on the Glut of Gold 967

WATER AND SANITARY AFFAIRS—

The London County Council and the Water Question—
The East London Company's Service 968
The Proposed Alteration in the Capacity of Flushing-Cisterns . 968

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market 969
Electric Lighting Memoranda 969
The Latest Labour War 970

NOTES:—

A Test of Belleville Boilers 971
Paints for Ironwork 971
A New Coal-Tar Antiseptic 971
More Metallic Sodium in Electric Light Conduits 971

COMMUNICATED ARTICLES:—

Notes on Current Topics. By "Veritas" 972
The Capital of Gas Companies and of Municipal Gas Undertakings. By Norton H. Humphrys, F.C.S., Assoc.M.Inst.C.E. 973

TECHNICAL RECORD:—

Midland Association of Gas Managers—The Quarterly Meeting in Birmingham—Discussion on Mr. Young's Paper on Prepayment Meters 974
The Commercial Value of Photometry 976
The Chemical Purification of Illuminating Gas 977
A Table for Equalizing Gas-Pipes and Branches 979

REGISTER OF PATENTS:—

Producing Gas by the Use of Electricity—Dunn, J. H. 980
Prepayment Gas-Meters—Cowan, W. and W. H. 980
Preventing the Freezing of Telescopic Gasholder Cups—Livesey, F., and Sugg, W. 981
Mantles for Incandescent Lamps—Crocker, S. H. 981
Patent Notices 981

CORRESPONDENCE:—

Defects of Water Meterage Systems 982
Keeping Up the Gas Supply without Gasholder 982
The Affairs of the Pará Gas Company 982

LEGAL INTELLIGENCE:—

High Court of Justice—Queen's Bench Division—Price *v.* The South Metropolitan Gas Company; The Southwark Bridge Explosion 982
High Court of Justice, Ireland—Queen's Bench Division—Alliance and Dublin Consumers' Gas Company *v.* The Dublin Corporation 983
An Ingenious Plea for Reduced Water-Rent 983
Liability for Gas on Common Stairs 983

MISCELLANEOUS:—

The Extension of the Croydon Gas-Works—Opening of a New Holder 984
The Disastrous Explosion in the Strand—The Inquest on the Fireman; Evidence as to the Cause of the Explosion. . . . 985
"Rings" for the Purchase of Residual Products 986
Meeting of the Imperial Continental Gas Association 987
Colonial Gas Association, Limited 987
Meeting of the Cape Town District Water-Works Company, Limited 988
New Water-Works at Launceston 988
Metropolis Water Supply—Proposed Alteration of the Metropolitan Water Supply Regulations 989
Notes from Scotland 991
Current Sales of Gas Products 992
Coal Trade Reports 992
Gas and Water Companies' Stock and Share List 993

PARAGRAPHS:—

Personal 967
The Directorate of the Imperial Continental Gas Association . . 968
Incandescent Gas *v.* Electric Lighting for Streets 969
"The Handling of Dangerous Goods"—Crystal Palace Old Students' Society 971
Cannel Coal in Newfoundland 974
Southern District Association of Gas Engineers and Managers—The Dangers of Trolley Wires—Flame Temperature and the Acetylene Theory of Luminosity 978
The Flow of Liquids in Channels—The Proposed Adoption of the Metric System in England—The Prevention of Smoke Arising from Intermittent Firing—Professor H. Adams on the Force of the Wind 979
The Proposed Adoption of Incandescent Gas Lighting at Fulham—Incandescent Gas Lighting at Winchester—The Charge for Gas in the Salford Out-Districts—New Joint-Stock Companies . . 982
The New Water-Works for Plymouth—The Electric Lighting Question at Bangor—The River Dee and the Chester Water Supply—Sales of Shares. 984
The Supply of Water at the East-End of London—Stonehouse and the Devonport Water Company 986
The Water Supply of Perranporth and St. Agnes—Exhibition of Gas Appliances—Rosario Water-Works (New) Company, Limited—Basingstoke Water Supply. 991
Proposed Water-Works for North Walsham 992
Suffocated by Gas—The Public Lighting of Crayford—The Proposed Electric Lighting Scheme for Swansea—The Richmond Main Drainage Works—Kingsbridge Water Supply—Enlargement of the Water Storage at Redcar—Drainage Works for Arundel—The Charge for Water 993

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

Telegraphic Address: "GASKING LONDON."
Telephone Number, 65,121.

EDITORIAL NOTES.

The Belfast and Clyde Strike and Lock-Out.

It is not surprising that the dispute in the shipbuilding and engineering trades of Belfast and the Clyde should attract general attention. It is not very wonderful that some of Messrs. Harland and Wolff's workpeople should entertain an opinion as to the rate of wages they ought to be paid which is not shared by their employers, nor even that they should accentuate their ideas by a strike. What is noteworthy and in the highest degree interesting is the development that has sprung from this apparently insignificant and ordinary occurrence. The employers quickly proceeded to exhibit to the world proof that they attached enormous importance to this outbreak; and a combination of the shipbuilding and engineering interests of Belfast and the Clyde forthwith disclosed itself to the astonished gaze of the rest of the country. The Clyde employers declared their "solidarity" with the Belfast firm by dismissing one-tenth of their working engineers; and the men's Society promptly retaliated by withdrawing the remainder. There has been nothing like the situation thus created in the whole history of industrial disputes. We frankly confess that we cannot understand it. Several newspapers have published condemnations of the action of the associated employers; and, of course, certain public men who are nothing if not "popular" have denounced them as guilty of a "penal act of terroism!" If this is so, it is nothing more than trade unionists have done over and over again. But we admit that this is no answer to the charge. Two blacks do not make a white. We cannot blame any employers for meeting combination among their workmen by combining themselves. But, on the face of it, a lock-out "for sympathy" is neither more nor less legitimate, as an operation in industrial warfare, than a strike "for sympathy." We should like to hear what the Clyde employers have to say for themselves; for it is absurd to suppose that they have no better case than that of the hare-brained socialistic agitators who have before now organized strikes "for sympathy," always with disastrous results. Mr. Frederic Harrison discusses the subject in an article in Saturday's *Daily Chronicle*, which certainly arraigns the Clyde employers in strong, but not objectionable terms. He refers in the course of it to the case of the gas stokers, who, he says, in 1872 "were "sentenced to one year's imprisonment for attempting to "'coerce' their employers by organizing a general strike. "This ferocious sentence," he goes on to state, "was "inflicted on the ground of the injury to the public which "the strike might inflict;" and he implies that the Clyde shipbuilders are acting a worse part than these misguided victims of the outraged majesty of the law.

We have discussed, in an article which appears on another page, the analogy, such as it is, between the case of the shipbuilding trade of Belfast and the Clyde and the gas industry. There is a degree of analogy, it appears to us, between the work of an arsenal, albeit a private one, and that of a gas-works; but we have attempted to show that it would not be to the advantage of trade unionists to stretch it very far. Gas making must be carried on, if possible, without intermission; and it is part of the duty of those who are responsible for the maintenance of this continuity to avoid as completely as they can all risks of breaking it. One such risk is recognition of the principle of Trade Unionism. The strike is the indispensable weapon of the Trade Union. To take away this weapon is to render a Union impotent; and then it may as well cease to exist. So long, however, as the Union remains in possession of its weapon, so long must the employers be left in possession of their only valid means of defence against it, which is the power of locking out. There is no possible way out of this position. Strike and lock-out are inseparable; and, indeed, where one is, the other is also. Of many of the greatest labour disputes, it would be difficult to say to which category they properly belong; for what one side calls a strike, the other regards as a lock-out. What, then, would those philanthropists do who are clamouring for Government or somebody to put an end to the Belfast and Clyde performances, in the interest of the nation? Shall an Act of Parliament be passed next session rendering it felony to either strike or lock-out when the building of a warship is in hand? This would be a logical, but hardly a sensible, proceeding. Let

us hope that the speedy termination of the dispute by agreement of the parties concerned may remove the difficulty in the only natural way.

The Curious Case of the Hertford Gas Company.

THE very remarkable case heard at the Hertford County Sessions, and fully reported in last week's JOURNAL—when the unfortunate Hertford Gas Company, whose recent deplorable experiences are known to our readers, were prosecuted and fined for two technical offences under the Gas-Works Clauses Act, 1871—is well worthy of passing comment. The case itself is interesting; but there is even more general interest attaching to the light which it sheds upon the inter-dependence of the General Acts of 1847 and 1871 and of the Company's Special Act. The Company were prosecuted, at the instance of the ex-Mayor of the town, in circumstances which, to say the least, did not favour the defence. Early in the year, the Company's books were mysteriously lost; so that it became impossible to deliver to the Local Authority, as required by law, a copy of the accounts for the previous year. The complainant pounced upon this omission, and also upon the inability of the Company to sell him copies of their accounts for previous years made up to Dec. 31. The facts were not denied; and in the event the Bench—who appear to have thoroughly understood the business before them—fined the Company two sums of 1s., with 9s. costs, for each summons. With regard to the omission to file accounts for last year, there is nothing to be said. As to the other complaint, it raised the old question of how far a Company with a Special Act incorporating the Act of 1847 are bound by the Act of 1871. The Hertford Company's Act is dated 1864; and it does not contain any provision relating specially to statements of accounts. This being so, the Company were unquestionably bound to follow the directions in this regard of the Act of 1871. As a matter of fact, they did not do so, but continued to make up their annual statements of accounts as they had been accustomed to prepare them under the Act of 1847—taking the year ending on June 30, and forwarding copies to the Clerk of the Peace. The Company's representative at the magisterial hearing could not deny that, after the decision in *The Dudley Gas Company v. Warmington*, his clients were in error; and so he confined his efforts to appealing for a merciful sentence, in which he was successful.

A correspondent has written to draw attention to the judgment in the case of the *Leamington Priors Gas Company v. Davis*, which appears to conflict with that in the Dudley case, inasmuch as the Court held that the Act of 1871 did not apply to this Company, who had also a Special Act incorporating the Act of 1847. If our correspondent—whose inquiry is welcomed as affording an occasion for clearing up what looks like an ambiguity of ruling—will turn to "Michael and Will," fourth edition, pp. 62, 63, he will find a note which deals with this very point. The Leamington variation on the Dudley rule was due to the fact of the Company having a special provision relating to accounts in their own Private Act, which the Dudley Company had not. Hence, they only came under the provisions of the 1847 Act where these were not inconsistent with those of their Special Act. Consequently, the provisions as to accounts contained in the 1871 Act did not touch them. This point is quite clear. Where a Special Act does not mention accounts, it is to be construed as accepting the provisions in this regard of the Act of 1847, and therefore of the Amending Act of 1871. Where special provisions as to accounts are contained in a Private Act which otherwise incorporates the 1847 Act, the former will prevail. "Michael and Will" also remarks (p. 52) that "a *general* Act of Parliament does not "repeal a previous *particular* Act, unless there are express "words, or unless the two Acts are necessarily incon-"sistent. . . . Where a General Act of Parliament is "incorporated with a Special Act, if there is any contra-"diction between them, the Special Act is to prevail." These references fully meet and overcome the difficulty raised by our correspondent. It is quite certain that, in default of special statutory provisions, the requirements of the Act of 1871 with regard to gas companies' accounts must be fulfilled.

The Imperial Continental Gas Association and Sir Julian Goldsmid.

THE half-yearly ordinary general meeting of the Imperial Continental Gas Association, held on Tuesday last, was memorable as the occasion of the distinguished Chairman—the Right Hon. Sir Julian Goldsmid, Bart.—taking formal farewell of the proprietors of the great undertaking over which he has presided for 21 years in this capacity, and 27½ years as a Director. It would be impossible to adequately express here what the Association and the communities served by it owe to Sir Julian Goldsmid's eminent services. As he told the proprietors, the late Chairman was very much more than the mere figure-head of this important corporation. From the day of his election to the chair, he has taken his position very seriously—working for the Association as he has never worked for anything else. This is a good deal for such a personage as Sir Julian Goldsmid to say; but the words are no idle vaunt, for it is not too much to declare that during the whole period of his tenure of office, the Chairman has been the guiding spirit of the Association. The duties and the responsibilities of the position must be onerous and delicate in a very exceptional degree. To occupy it only without giving offence to the susceptibilities of the authorities and organizations with whom the daily business of the Association has to be carried on—to preserve the prestige and prosperity of an essentially British trading corporation drawing its revenue from the denizens and rulers of cities and towns of every grade of political and commercial importance, scattered over many lands where jealousy of foreign enterprise is endemic—is a charge which the ablest administrator and diplomatist might well find heavy enough to bear. To have done this, and more—to have the satisfaction of seeing both prestige and prosperity grow under one's handling; to have increased the number of friends at home and abroad; to feel that, in relinquishing such a charge, one is leaving the multifarious interests composing it in better condition than they were when it was taken up, and that those upon whom the important charge will devolve inherit with it the stimulus of a great example and the guidance of a worthy tradition—this is the reward that Sir Julian Goldsmid takes with him into his well-earned retirement, which we sincerely hope, notwithstanding its cause, he will live long to enjoy. So far as the record of the last half-year's working of the Association reflects the condition of European trade and the fortunes of the gas industry during this period, the report read at the meeting is eminently reassuring and satisfactory; and the same may be said of the circumstances of the undertaking itself. An increase of 3·6 per cent. in the output of gas, and of exactly the same proportion upon the number of lights connected, constitute the best evidence of the vitality of gas lighting all over the European Continent. The Association now pay 12 per cent. upon a capital of £3,800,000; and the fortunate proprietors of this stock have the comfort of knowing that it is as likely to go on paying well in the future as it has been at any time in the history of the Association.

Who is Responsible for the Proper Care of Highways?

JUDGMENT was given last Saturday in the Lord Chief Justice's Court, in the important appeal case preferred by the South Metropolitan Gas Company against the decision of the County Court Judge for Lambeth, casting them in damages in respect of injuries caused by the Southwark Bridge explosion in February last. The details of the matter were published in the JOURNAL at the time. The County Court Judge found that the Company had been guilty of negligence; and he gave the plaintiff £12 as damages for the injuries he had sustained from the explosion. The question raised on appeal was whether there had been any negligence on the defendants' part; and this, in view of the circumstances, was a highly important point requiring to be settled by the Superior Court. Sir Edward Clarke appeared for the appellants, and urged that the Company had no liability unless there was distinct proof of negligence. It was admitted that the ground underneath the fractured main from which the gas that exploded escaped had been disturbed, but not by the Gas Company, whose negligence, if any, must consist in their remaining ignorant of the circumstance, and consequently omitting to take the necessary measures to render their main safe. In his judgment, the Lord Chief Justice laid stress upon this aspect of the matter; remarking that it seemed a serious omission in the statutory enactments that there was no compulsory provision to compel any public body, when taking up the highway, to give notice to all the other bodies who had pipes or mains there. Yet he went on to observe that it was not really

imposing a very onerous duty on the Gas Company that they should be vigilant in seeing that, when any other body had reason to excavate near their pipes, these were left in a safe condition. In this particular instance, it was held that reasonable care and diligence on the part of the Company's servants would have led to the discovery of the injury to the main. It certainly does seem, as the Lord Chief Justice admitted, anomalous that a highway authority should be free to do what they like, without notice, to a roadway containing pipes for the safe condition of which other people are responsible. The position here is decidedly one-sided. Section 8 of the Gas-Works Clauses Act, 1847, and the subsequent sections, are very stringent upon the matter of the breaking up of roads by gas companies; and it is hard to see why the highway authorities themselves should have a perfectly free hand for executing works liable to imperil gas-mains, and even be absolved from the consequences of actual carelessness in the carrying out of such works. It is to be hoped that the South Metropolitan Company will not rest satisfied until the highest legal authority has had the opportunity of pronouncing upon the actual state of the law in this regard. If the result should prove unsatisfactory, there will be clear ground for invoking the aid of the Legislature for putting the responsibility for conserving the interest of public security upon the right shoulders, which are, surely, those of the parties to any improper treatment of the highway. The real question at issue is more than a mere matter of gas-pipes.

Gas Residuals and "Rings."

A curious piece of intelligence comes from Manchester, to the effect that the Corporation Gas Committee have determined upon setting up products works, to counteract the machinations of an alleged "ring" of local manufacturers. If the statement in this regard attributed to Mr. Alderman Gibson, the Chairman of the Committee, is to be credited, the manufacturers of sulphate to whom the Manchester ammoniacal liquor has usually gone, have so far forgotten the traditions of the local school of Free Trade as to organize a "knock-out" against this product. They must have been singularly artless in carrying out their designs, if, as alleged, the whole scheme was betrayed through the appearance of only one tender for the last Manchester liquor contract. For surely, a very infantile degree of craftiness would have suggested the sending in of two or three nicely graduated tenders, if only to save appearances. It is not for us to say whether there is or is not such a "ring" of sulphate manufacturers in the Manchester district as Alderman Gibson's fancy has pictured. There have been such things before; and the "same old game" will often be played again, even in the home and nursery of Free Trade. We would venture to remind Alderman Gibson and the Manchester Corporation Gas Committee, however, that if they fondly think to escape all troubles of this character by the simple expedient of working up their own residuals, they will be rudely awakened, in the fulness of time, to a very different reality. Converting the residuals of gas manufacture is only half the battle; and by far the easier half to carry through satisfactorily. There remains the selling of them, which is a mighty delicate and risky business, as at present conducted. Will the Manchester Gas Committee succeed in a commercial operation in which so many gas-works administrators have so far conspicuously failed? Perhaps they may, if they do not try to be too clever, and set themselves to manipulate the market. If they will sell all their products by auction, in concert with the actual consumers of the commodities, they will possibly keep clear of the "rings" which are frightening them into an untried course of action. But unless they are well guided in this regard, they will early learn that it is as easy to "knock out" sulphate as the raw material.

A Banker on the Glut of Gold.

At the first meeting for the present session of the Institute of Bankers, the Hon. H. Dudley Rider, the President, delivered an Inaugural Address which, although in the main technical, contained some observations of interest to people other than bankers who have to do with the investment or employment of capital. He remarked that there is no more significant financial feature of these times than the accumulation of gold in banking centres, and particularly in the Bank of England. The total holding of gold of the banking head-quarters of England, France, Germany, and the United States on Sept. 30, 1885, amounted to £120,620,000; whereas on the same date of the present year the store had increased to £185,936,000—the increase for the ten years being thus no less than £65,316,000. These figures, the speaker admitted, are very remarkable; and he offered several explanations to account for them. The first was the increased production of gold. It was suggested that the reserve of gold to be kept by the Bank of England should be maintained at a higher figure than the level which Mr. Walter Bagehot, writing in 1873, called the "apprehension minimum"—say, at not less than 15 millions sterling. Another consideration arising from the plethora of gold is that its further increase, which is not unlikely, may bring about the prevalence of an "entirely "new set of economic conditions. Might they not be "justified in asking," said the President, "whether it was "not possible that capital would gradually become still "less loanable? Would interest continue to fall, and, "correspondingly, would they see Consols at 125, and the "price of all gilt-edged securities rising in like proportion?" This question touches directly upon the future value of gas stocks, and also upon the redemption of municipal loans. Evidently, the more capital that can be kept out in safe and reasonably profitable employment, the better. Municipal gas undertakings ought to keep out of the way of saving, by selling gas as cheaply as they can. This is no far-fetched comment upon Mr. Dudley Rider's observations; for the financial circumstances of such public bodies as the London County Council establish the connection. This particular local authority partakes with others the liability to repay its capital borrowings. But it has the greatest difficulty in finding a proper use for the money which it raises out of the ratepayers for this purpose. Hence it has been asserted by one of its own members that the County Council are only too glad when the parochial and other Metropolitan authorities which it finances want to borrow money from it for electric lighting or other purposes, because these are outlets for the unmanageable accumulations of its treasury. It has been pointed out that this state of things is not without danger, and that, in point of fact, the financial operations of the different Metropolitan authorities are fast getting to resemble the uneconomical procedure that has been described as "feeding a dog with his own tail." It is a curious reflection that at one and the same time the members of a self-governing community should be groaning under the burden of the rates, and yet be perplexed as to what to do with their accumulated savings. Paradoxical as the situation may appear, however, when presented in this light, the essential features of it, as indicated rather than described by the President of the Bankers' Institute, are too real to be altogether pleasant. We should like to hear from other financial experts on the same subject; for, though the theory is intelligible enough, it is not so easy to form a trustworthy opinion about the practical issues.

Personal.—Mr. Frank Wright informs us, with reference to the purchase of his penny-in-the-slot meter by Frank Wright's Prepayment Gas-Meter Corporation, Limited, that the photometrical, experimental, and consulting business of Messrs. Alexander Wright and Co. still remains his property, and will be carried on by him as formerly.——Mr. W. A. Laker has been appointed a Director of the Redhill Gas Company, in succession to the late Mr. W. Stenning, J.P.——M. Berthelot, the eminent chemist, has been appointed Minister of Foreign Affairs in the new French Cabinet. He was Minister of Education in the Cabinet of 1886-7.——Among the distinguished scientists who have been recommended by the President and Council of the Royal Society for election into the Council for the ensuing year are Mr. W. Crookes, F.C.S., Lord Kelvin, Professor A. B. W. Kennedy, and Professor A. W. Rücker, M.A. Professor Crookes has been for some years one of the Analysts who report monthly on the quality of the Metropolitan Water Supply on behalf of the Water Companies, and Professor Rücker is one of the Metropolitan Gas Referees.——The honorary degree of LL.D. was conferred upon Mr. Lawrence W. Adamson, J.P., the Chairman of Messrs. John Abbot and Co., Limited, of Gateshead, and a Director of the Newcastle and Gateshead Gas and Water Companies, on the occasion of the recent celebrations in connection with the Aberdeen University.——Mr. J. Tweedale, the Chairman of the Gas Committee of the Leeds Corporation, has resigned the position, and retired from the Council.——Mr. E. Wigglesworth, Engineer and Manager of the Perth (Western Australia) Gas Company, is now in England on leave of absence.——Mr. F. Hyland has been appointed Chairman of the Ashford Gas Company, in place of the late Mr. J. U. Bugler; and Mr. R. Parkes has been selected to fill the vacant directorship.

WATER AND SANITARY AFFAIRS.

A YEAR ago, sanguine in their expectation that the Transfer Bills by which possession of the property of the Water Companies was to be secured would receive the sanction of Parliament, the County Council abstained from carrying out their resolution of the previous July in favour of obtaining legislation to raise the limit of height to which the East London Water Company are required to give a supply. The Council desired a height of 70 feet from the level of the nearest pavement, in place of the present limit, which, according to the East London Water-Works Act of 1853, is 20 feet above the level of the pavement for "ordinary service"—any supply going higher than this being designated a "high service." Although the members of the Parliamentary Committee of the Council are understood to include a majority of Moderates, the Committee presented a report at the last meeting of the Council, stating that, while they considered it was "inexpedient" to proceed with a Bill for raising the height of the East London supply simultaneously with a Bill for buying up the undertaking, they had now "fully considered the "matter," and had decided on the form of a Bill dealing with the East London Company to be brought forward in the coming session. The original scheme is so far modified that the present proposal is to place the Company under the provisions of section 35 of the Water-Works Clauses Act of 1847. This section, instead of specifying a certain number of feet, requires that a supply of water shall be constantly laid on at such a pressure as will make the water reach to the top storey of the highest houses within the limits of supply. Such at least is the reading that is given to the section by the Parliamentary Committee. But they have failed to add certain important words which immediately follow this requirement, whereby a condition is introduced which says, "unless it be "provided by the Special Act that the water to be "supplied by the undertakers need not be constantly laid "on under pressure." Moreover, it is expressly stated that the supply in question shall be for "domestic use." That which calls for special notice in regard to this matter is the obvious circumstance that the Council had no idea of submitting themselves to section 35 of the Act, supposing they had succeeded in acquiring the undertaking of the East London Company. Now that the Company are secured in possession, the Council are prepared to enforce the most stringent conditions with respect to the supply. When the recommendation of the Committee came before the Council last week, it was adopted with only a slight attempt to get the report referred back. The Parliamentary Agent is therefore to draft the Bill according to the views expressed in the report; and the notices are to be duly issued. In the brief debate which preceded the adoption of the Committee's recommendation, Mr. Charles Harrison expressed an opinion that the Company should be compelled to submit to "the law of the land" as the price of having "such a monopoly." The Council would be exempt from "the law of the land," although possessing a monopoly of the most absolute kind. There is to be one law for them and another for the Company.

In their zeal against the Water Companies, the County Council are furnishing the consumer with a very fair inducement for allowing the supply to remain where it is. The Council can take up the cudgels against the Companies; but who will fight the consumer's battle against the Council? Had the Council felt assured of carrying the purchase scheme, would they have called upon the Local Government Board to open the inquiry which has just been concluded by Colonel Ducat, as to certain regulations governing the water supply, especially the flushing power provided for household water-closets? The Council asked that the flush of two gallons should be increased to three. After asserting that the Companies were unable to meet existing demands, the Council asked that these demands should be augmented by 50 per cent. in the case of a large portion of the supply. The evidence given by Mr. Bryan and Mr. Restler, as well as by other Engineers, shows how enormous would be the increase—amounting to at least 12 million gallons daily, supposing it to comprehend the entire area of the various districts. *London* is good enough to say that if the extra flush were legalized and enforced, "the Companies would have to take immediate steps to "increase their storage reservoirs and their supplies." To this it may be added that the County Council would strive to the uttermost to prevent the Companies from making any such addition to their works. *London* further says that the object of the Companies in opposing the proposed change is to conceal the weakness of their position, "and to maintain the artificial value of their "properties." It is far more evident that the object of the Council is to depreciate the real value of the undertakings, so as to prepare the way for any scheme of purchase that may be attempted later on. The increased flushing power would be simply so much waste, serving to hide the defects of private fittings. Sir F. Bramwell, who estimated that the extra gallon would mean an augmentation of 10 or 12 million gallons of water per day in the total, drew attention to the fact that this would call for increased capacity in the sewers. Witnesses for the Council asserted that the two-gallon flush was insufficient in the case of the model lodging-houses; but Mr. Farrant, the Deputy-Chairman of the Artizans' and Labourers' Dwellings Company—an authority connected with other companies of the same kind—gave evidence showing that the two-gallon flush used in the dwellings of these companies was perfectly satisfactory. Dr. Parkes, the Medical Officer of Health for Chelsea, after giving evidence in support of the case for the County Council, admitted in cross-examination that, with very few exceptions, throughout the country, in districts where there were regulations in force as to the supply of water for sanitary purposes, the two-gallon flush was the one adopted. This at once suggests the consideration that if the three-gallon flush is to be established in London, it must either be a wilful waste of one gallon in each flush, or must be a necessity everywhere. Thus the subject grows to a matter of even greater magnitude than that of the mere Metropolitan supply, and affects the water question throughout the country. Great importance will therefore attach to the conclusions arrived at by Colonel Ducat and the Local Government Board in connection with the recent inquiry. It was urged by Mr. Freeman, that Edinburgh, Bradford, and three other towns of some size, have adopted the three-gallon flush. But the majority of towns have not done so; and if the minority like to indulge in a luxury, that is no reason why others should have more than is necessary. The old maxim of "Waste not, want not," is specially applicable to the question of the water supply. Late experience has shown there is urgent reason for husbanding the water supply when it abounds, to be prepared for the time of drought.

On the statistics of this question, something remains to be said. Mr. Freeman, in summing up his case, ridiculed the idea that the extra gallon per flush would represent so many million gallons per day as the Companies had stated. On this point, we submit that it would not be at all unreasonable to suppose the extra consumption due to the three-gallon flush would represent an average of two gallons daily per head of the population. This, according to the most recent data, would correspond to more than 11 million gallons daily over the entire area of the supply; thereby justifying the general estimate presented by the witnesses for the Companies. But even a higher estimate may be perfectly admissible. All depends upon whether the calculation is based on an entire or only partial application of the enlarged flush—supposing that one is ordered. We may presume that the change, if brought to pass, would be permissive in regard to existing closets, though compulsory with respect to all future constructions. If an order were made which went beyond this, the expense to landlords and leaseholders would be enormous, independently of the burden cast upon the Water Companies. On this point, the evidence of Mr. Collins, the Engineer to the New River Company, as given under re-examination, deserves to be carefully considered. The question is whether compulsion can go beyond an obligation to which the Companies would be rendered liable.

The Directorate of the Imperial Continental Gas Association.—Consequent upon the retirement of Sir Julian Goldsmid from the chairmanship of the Imperial Continental Gas Association (to which reference is made in another column), we are officially informed that the following changes have been made in the directorate: Mr. T. H. G. Newton, who has been a Director of the Association for twenty-eight years, and Deputy-Chairman for five years, has been elected Chairman; Mr. J. Horsley Palmer, a Director of twenty years' standing, will succeed Mr. Newton as Deputy-Chairman; and Sir C. J. Jessel, Bart., has been chosen to fill the vacancy upon the Board caused by Sir Julian Goldsmid's resignation of his position as a Director.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 993.)

THINGS have gone from bad to very much worse on the Stock Exchange; and last week they had such a time as they have not had for a long while. The opening day was pretty fair. But the clouds rapidly became very thick; and the rest of the week was stormy indeed. The state of things in the Kaffir market appears to be chiefly responsible for it, where heavy bull accounts remain to be met; and it looks as if much trouble is in store for the settlement. Then foreign relations were very disquieting; and though Lord Salisbury's speech is reassuring to an extent, a considerable balance of anxiety will probably prevail awhile. It almost goes without saying that prices pretty well everywhere have been knocked down like ninepins; and on Saturday, when things were at their worst, Consols actually touched 104⅞, but they rallied before the close. The Money Market had a better turn; and higher rates were easily obtainable. Business in the Gas Market was brisk and animated, and was attended with some interesting features. In Gaslights, the "A" showed confirmed weakness at first, and opened at 292½. But, after some hesitation, it rallied, and recovered rather more than its losses—closing at 295. In the secured issues, business was remarkable; the number of transactions being probably unparalleled in any previous week. Prices were excellent generally; and the 4½ per cent. debenture stock marked a "record" at a level 150. South Metropolitans were not particularly active; and prices were only fair. Commercials were unprecedentedly active on a fair chance of business being done presenting itself. Both stocks were full of rise, only waiting an opportunity, especially the new, which jumped from 239½ on Thursday to 251 on Saturday. Since we drew attention a fortnight ago to their false position, both stocks have risen more than 20 points. Movements in Suburbans and Provincials were extremely capricious and irregular. Alliance old was thrust down, and the new was put up; and the seesaw being played with British and Brentford new was kept going. Bromley new advanced; but the old lagged behind. In the Continental category, Union was put down, after being put up the week before; but the rest were steady. Among the remoter undertakings, Oriental advanced; but Buenos Ayres was lower. Business in Water was quiet, and devoid of feature. Lambeth and Southwark ordinary were a point easier.

The daily operations were: Business in Gas was only moderately active on Monday; and the general tendency was not good. "Gaslight "A" fell 1; Brentford new, 2; and Buenos Ayres, ½; but Commercial old rose 2. Lambeth Water fell 1. Dealings on Tuesday were more brisk, especially in Gaslight secured; but quotations did not move. Business fell off on Wednesday. Alliance old receded 1½; but ditto new rose ½. Transactions on Thursday, though not extensive, on the whole were considerable in Commercials—each advancing 3. Gaslight "A" rose 1½; ditto 4½ per cent. debenture, 2; and Bromley new, ½. In Water, Southwark fell 1. Friday's operations were mostly in Gaslight "A," and at better figures. British improved ½; and Oriental, ½. But Alliance old was ½ lower. Saturday was a very busy day, Commercials again having the lion's share. The old stock rose 2; and the new, 7. South Metropolitans were active, but unchanged.

ELECTRIC LIGHTING MEMORANDA.

Electric Light Inquiry at Wimbledon—Public Lighting Problems of Wimbledon—The Attitude of Gas Companies to Electric Light Schemes—The Real Duty of Incandescent Lamps.

THE proceedings at the Local Government Board inquiry into the proposal to expend some £32,000 of public money upon the electric lighting of a part of the district of Wimbledon (briefly mentioned in last week's JOURNAL), are typical of the kind of thing that is becoming a scandal. One of the Royal Engineer officers, who are such favourites with the authorities on both sides of Whitehall, conducted the inquiry. The case for the scheme was advocated by Mr. Fletcher Moulton, Q.C.; while the opposition, represented by the Ratepayers' Association, was defended by Mr. Castle, Q.C. Mr. Moulton had an interesting task in trying to convince the Inspector that a locality which has hitherto made shift with oil-lamps in the streets, for the sake of economy, is justified in going in for the most expensive means of public lighting; for it is a cardinal feature of the scheme that incandescent electric lamps are to be used for this purpose. Mr. Moulton would not be the ornament of the British Bar he is, if he were daunted by such a trifling difficulty as this. For the opposition, Mr. Castle had little trouble in bringing out the factitious character of the electric lighting scheme, which was devised by Mr. A. H. Preece, of course with the valuable aid of his eminent father, who is himself one of the shining lights of Wimbledon, where his illuminated dolls' houses have long been exhibited as triumphs of modern electrical science. Mr. Preece himself attended the inquiry and supported his son's plans; but his magnificent generalities, and customary paradoxes, did not materially help to clear up the problem of whether Wimbledon wants the scheme which the District Council are bent upon forcing upon the ratepayers. It was shown that every means open to the ratepayers for expressing their views upon the proposal of their legal representatives had been taken, with the uniform result of proving that hardly anybody outside the District Council approves of it. So long ago as 1890, the same scheme was rejected by a public meeting. But this time the District Council have taken good care not to run the same risk again. Still, a public meeting was called, which the Chairman of the District Council, a strong partisan of the scheme, was invited to attend. He did attend; he was heard; and his scheme was rejected by a practically unanimous vote. The District Council were asked to receive a deputation, but they refused; they were asked to have a poll, and this was also refused. Yet they go on with their scheme, and ask the Local Government Board to allow them to tax the district for a luxury for which it cannot be shown that there is any demand.

There are one or two peculiarities about this Wimbledon affair which appear to need some explanation. The old Local Board quarrelled with the Gas Company, who seem to be held in some despite in this neighbourhood because their headquarters are in the adjoining district of Mitcham. However this may be, the Company in question are among the smallest of the Metropolitan Suburban gas undertakings. They supply 15-candle gas, and charged last year 3s. 8d. per 1000 cubic feet for it. Their main mileage is excessive for the amount of gas consumption; and yet so straggling is the Wimbledon portion of their district that there are no mains in some of the roads that require lighting. Whatever may have been the case formerly, when the Gas Company did not see their way to serving the scattered street (or rather road) lamps of Wimbledon at a lower price than they charged elsewhere, they have lately endeavoured to meet the District Council with a concession, which not even their enemies have termed unreasonable. The District Council would have nothing to say to the Company, however, as the Chairman told the Inspector, because to accept their offer for the thoroughfares where the mains run "would mean a dual system of lighting—partly gas and partly oil." Yet this same gentleman, with all his dislike to a "dual system," is set upon having the very same thing with electricity and oil. He would probably say, if confronted with this inconsistency, that circumstances alter cases.

There is another point of this business which, as at present advised, strikes one as a bit of mistaken policy on the part of the Gas Company. It was stated at the inquiry, and admitted by some members or friends of the Ratepayers' Association, that the organized opposition to the electric light scheme had been subsidized by the Gas Company. This may mean much or little. As large ratepayers, the Gas Company might well assist any opposition, regarded by them as well grounded, to proposals likely to increase the rates, from whatsoever source arising. All the same, we are strongly of opinion that the less gas companies intermeddle with the electric light schemes of local authorities, the better. Their support to opponents of such schemes is enough in some places to determine the flow of popular sentiment in its favour; and in any case they can do themselves no good. We know that enthusiastic directors and chief officers of gas undertakings up and down the country do allow themselves to be stirred up by the flagrant partisanship of members of local authorities for electric lighting, to take sides in opposition to this misuse of administrative positions. But they had better remain quiet than increase the risk of their motives being misrepresented, as inspired by mere trade jealousy.

Recently the *Electrical Review* published some modern results of incandescent electric lamp tests, which are worthy of notice. Our contemporary remarks that, in electric supply statistics, the word "lamp" has the conventional meaning of an 8-candle lamp, which again is conventionally supposed to mean a consumption of 35 watts of current. From the mean of the English-made lamps tested, the proper consumption is really about 38 watts for an 8-candle power lamp. So that, here again, the electricians have been kind to themselves. It further appears that the average English-made 16-candle lamp takes 60 watts of current; yielding an average illuminating power of 14·21 candles throughout its normal life of 600 hours. Similarly, the nominal 8-candle lamp has an average illuminating power of 7·81 candles. It is remarked that for all-round efficiency the English-made lamps are more than holding their own against the cheaper Continental-made article. As 16-candle power lamps can be bought for anything from 6d. to 2s. each, while they may consume anything from 10 to 80 supply units during their life, it is clear first cost is only a small part of the total expenditure for light which it represents before it is done with.

Incandescent Gas v. Electric Lighting for Streets.—The Chagford Local Authority have decided to discontinue the electric lighting of the streets; and they have accepted an offer made by the owner of the gas-works (Mr. Willey, of Exeter) to light them by means of incandescent gas-lamps.

THE LATEST LABOUR WAR.

THE troubles in the shipbuilding trade of Belfast and the Clyde entered upon a grave phase last week, with the decision of the executive of the engineers' trade societies to withdraw their members from the works in the latter district, in which the partial lock-out necessitated by the employers' agreement with the Belfast shipbuilders had been enforced. Honestly speaking, if the Trade Union meant to fight the matter out to the end, there was nothing else to be done. It brought the issue to a climax, if the phrase may be permitted; and at the same time it awoke the whole country to a lively sense of what a labour dispute between organized employers and one of the strongest of the so-called "old unions" means. So far as the shipbuilding trade alone is affected, of course we have no particular interest in this dispute; but there are several considerations growing out of the state of things at present existing in Belfast and on the Clyde which no employers of labour—especially in a great national industry—can afford to disregard. The affair also has certain aspects of great interest for observers of the ways of trade unionism, and for ordinary citizens. The original causes of the trouble, which began in Belfast, need not now be discussed. The important facts of the situation to be considered are—first, that a powerful Trade Union composed of skilled workmen have preferred a demand for increased pay which may or may not have been justifiable from the men's point of view; secondly, that the employers, likewise with or without justification from their own standpoint, have met the demand in a way which has resulted in the partial stoppage of a national industry, and must also entail the paralysis of an incalculable number of other industries.

It is natural for the best organs of public opinion to discuss the affair from the standpoint of national interests. Accordingly, the *St. James's Gazette* points out, as an alarming feature of the situation created by the actions of the shipbuilders and their men, how the execution of Admiralty contracts may be suspended, possibly for months, and the nation be consequently deprived of ships which may be badly wanted. The stoppage may have been due in the first place to a question of money; but no money can make up for lost time. The *Daily Graphic* follows on in the same strain, arguing that "the Clyde shipbuilders are not merely private venturers for profit; they are, in a very literal sense, the servants of the country." And the cry is raised that the needs of the nation must not be left to go unsatisfied because a few employers prefer to close their works rather than yield to every demand of their workpeople. This is all very well; but what is to be done to remedy the mischief—by Government or anybody else? It has been understood that Messrs. Harland and Wolff, the great Belfast firm, would have nothing to do with trade unionists, because they preferred to keep the control of their business in their own hands. If the attractions of the Amalgamated Society of Engineers have proved too strong for the Belfast men, and Harland and Wolff's yard has become a "society" establishment, the present result of a local wages dispute goes far to support the original policy of the firm. But, again, what is to be done? If the employers and the Trade Union cannot settle their differences by agreement, which party is to be coerced, and how?

The greater issue herein raised—of the ultimate interest of the community in the prevention of strikes and lock-outs in an industry of national importance—is precisely the same as that which has been kept steadily in view by those who have given in their adhesion to the principle that the extension of trade unionism cannot be permitted in industries which are also public supply services. There must be no Trade Union of postmen, firemen, railway servants, the employees of municipal sanitary departments, or gas workers, if the public interest is not to suffer. All experience goes to show that, with whatsoever fair promises so-called "trade" societies of this order of workers may start, sooner or later (if they grow and prosper) they come into conflict with the authorities who are responsible for carrying on the service. And it may happen that the ostensible cause of difference is something which the outside public cannot understand, or are led to misunderstand in the supposed interest of the workpeople. If the service is gas supply, for example, a plausible demand for increased pay, for shorter hours of labour, for holidays, or some other quite legitimate amelioration of the conditions of employment, will be made by the Trade Union officials in the name of the workers. If such a demand is once acceded to, the Union is exalted in the eyes of the populace and its members. All the resources of the cheap newspaper press, and the aid of the pulpit and the platform, are bespoken for the glorification of the victorious Union; and even men who suspect that Union leaders are not wholly disinterested in undertaking to obtain for the working man what he is supposed to be unable to gain for himself, are over-persuaded that it pays to take a society card. The only safe policy to follow in the face of a Trade Union demand is to refuse to recognize the agency through which it comes. We are not speaking now of the affairs of a purely commercial concern, or any question of work or wages arising in connection with a private business. A boot manufacturer, or a printer, may be safely left to find out for himself whether he can work his establishment as a "society house," or not. In the case of workpeople engaged in the performance of tasks which are in any important degree public services, the position is clear—no Trade Union should be recognized or dealt with by the employers of such labour, under any pretence whatsoever.

Of course, the men who perform necessary public services deserve all reasonable consideration and fair treatment. We have no sympathy—rather the opposite—with those employers who do not keep abreast with the times in this respect, and obstinately adhere to the notion that what has been will always be good enough for their workpeople. Such masters are foster-fathers of trade unionism, and are a danger to their order. But when a gas manager, or the head of any branch of the national or municipal service, pays his men the full market value of their work, and gives them reasonable compensation for anything they might be supposed to lose by turning their backs upon trade unionism, whatever happens to the service, he cannot be blamed. And that troubles will come where the Trade Union leader is in authority, is as certain as that the night follows the day. For it is by keeping things in a continual ferment that these men live. The moment their supporters are satisfied, or at least feel that they can get no more through them, they become a superfluity. The societies that hold sway over the trades which follow the course of the open market retain their usefulness, in the estimation of their members, because their agency may be required at any moment to obtain an increase or resist a reduction of wages. The men whose work is a public service do not feel the changes of the labour market, or only experience them in one sense—that of improvement. In the gas-supply service, reductions of wages are unknown. Hence in such a service, the Trade Union agitator can only keep his footing by ceaselessly interfering with other conditions of the employment. This is the justification of those who regard him as a nuisance, not to be borne with upon any terms.

It is apparently forgotten by those well-meaning people who think the Belfast and Clyde shipbuilders are blameworthy for suspending work upon ships intended for the Navy, rather than give into the Trade Union demands, that an employer has every inducement, besides the sense of duty to the country and the community, for keeping his establishment going, if possible. His capital stands engaged; his staff must be paid; his rent and other permanent charges remain to be borne, whether he is turning out his usual product, or not. To shut the works gate is the last resort of a solvent employer, or of one who desires to remain so; and it is hard for an ousider to say when or how he is to be deprived of this most costly means of self-defence. The public are apt to forget that the employer's reluctance to take this step is one of the considerations upon which trade agitators most confidently rely for getting their own way. And when the case for keeping the gates open is reinforced, as it is in the *pseudo*-services, national or municipal, by consideration of the interest of the community, it is all the more important that the agitator should be prevented from manipulating this advantage. In statutory gas supply, the justification for a lock-out would need to be very clear and strong indeed to acquit before the bar of public opinion those who might counsel or carry it out. But nevertheless such justification is not unattainable. As a matter of fact, every ground upon which it would be supported exists in very many—perhaps the majority—of the gas-works of the United Kingdom at this hour. These are the establishments where the workpeople have no reasonable grievance left, and where not the most ingenious trade agitator could manufacture a case for one.

It is perhaps hopeless to look for a similar condition of affairs in a trade governed by commercial considerations. But, after all, the Belfast and Clyde employers must be supposed to be the most competent judges of their own business, including that of knowing when and how to meet their enemies. The emergency must be regarded as grave that could unite rivals in trade in a common policy of stopping work. The Amalgamated Engineers are reputed to be a wealthy body, as they are admittedly strong in membership; but there is a running sore in the constitution of the Society which must render the leaders averse to squander their resources upon a strike for a local cause. Of all trade societies, this has the highest average of unemployed members, and pays the largest sums for out-of-work relief. The reason given for this chronic condition of the Society is instructive. It is that the rules have been so successful in raising the minimum rate of wages to be accepted by members, that employers will not engage men over 45 years of age, who might be unable to earn the full Society wages, but prefer younger men. Consequently, the out-of-work relief paid by the Society is to an unknown (but perhaps a large) extent old-age pensions in disguise. If this is so, the future is not likely to bring to the Society increase of strength.

Lastly, the present dispute is a warning against imperfect settlements of wages questions. Some time ago, Messrs. Harland and Wolff were compelled to dock wages by 2s. per week, in consequence of bad trade, promising to return to the old rates when trade should revive. Now the men say that trade has revived, and the firm accordingly ought to perform their promise. The firm object that the improvement does not affect work in hand; and they declare that they must be the sole judges as to when their engagement becomes redeemable. Hence all this trouble; and the end is not yet. Our sympathies are with the

coal and iron trades of Lanarkshire, which are only too likely to suffer from the stoppage of the engineering works. The whole business is calamitous; but we at any rate are not disposed to hold the employers to blame for their share in it, without knowing more of their case than has yet been published.

NOTES.

A Test of Belleville Boilers.

In view of the growing popularity of boilers of the water-tube type, which are acknowledged to be well adapted for burning breeze and many other poor kinds of fuel, and to be capable of almost any degree of forcing upon an emergency, some recently-published particulars of evaporative trials of Belleville boilers built by Messrs. Maudslay, Sons, and Field may be recorded. The test was carried out on the 1st ult., at the builders' works at Greenwich. At 5.40 a.m., the fires were lighted—the weather being foggy and damp; but at 6.20 a.m., the steam-gauges registered a pressure of 200 lbs. At 8 o'clock, the official evaporative trial commenced, and was continued for twelve hours, with the result of showing that the average evaporative duty was 8·81 lbs. of water per pound of coal; the steam pressure being 200 lbs. throughout, and the temperature of the feed water 54° Fahr. Welsh steam coal of average quality was used for the trial; and the fires were cleaned at the end of the sixth and tenth hours. The ordinary consumption of fuel was at the rate of from 17 to 19 lbs. per square foot of grate surface per hour; but at the conclusion of the trial an accumulation test was made to ascertain the effect of forced firing. Coal was burnt at the rate of from 35 to 40 lbs. per square foot of grate surface per hour; the steam pressure rising to 247 lbs. It was then proved that the safety-valves were capable of dealing with any quantity of steam likely to be produced. The test was considered to be highly satisfactory by all concerned.

Paints for Ironwork.

Mr. Walter A. Berry has reported upon the best paints and methods for painting iron bridges, viewed from the standpoint of a railway engineer; and extracts from his report, which is described as composed largely of privileged communications, have been published in the American *Engineering News*. Though unable to give his authorities, Mr. Berry formulates several personal deductions and conclusions from them. He classifies paints in common use for structural purposes as follows: (1) Oxide of iron and linseed oil paint; (2) red lead paint; (3) asphalt paints, consisting of mineral and artificial asphalts or coal tar, alone or combined with each other, and frequently mixed with metallic bases, oils, and other materials; (4) carbon and graphite paints; (5) patent paints. Ochre paints have not had an extensive trial; but they are recommended by Dr. Charles Dudley, Consulting Chemist of the Pennsylvania Railroad. His formula for such paint is: French ochre, 39 lbs.; lamp black, 1 lb.; raw linseed oil, 54 lbs.; japan, 6 lbs. Oxide of iron paints consist, or should consist, of iron oxide ground in linseed oil; but sophistications have become so common in the trade that the whole class of such paints has fallen into some disrepute. Pure oxide and pure oil, properly mixed, are yet considered by Mr. Berry as capable of yielding very good practical results for iron bridges, despite all theoretical objections to the use of iron paints in general for priming iron. Referring to oxide, red lead, and tar paints, Mr. Berry inclines to the common-sense opinion that the fact of an article or a method being widely used, though not conclusive, is at least presumptive evidence that it is useful, and adapted to its purpose. With regard to the covering power of paint upon ironwork, it is stated that good red lead paint will compare favourably with the cheaper iron oxide and asphaltum paints. The composition of so-called asphalt paints is too various and uncertain to attract Mr. Berry's favourable regard; but he nevertheless speaks well of a sample of such a paint composed of asphaltum, linseed oil, turpentine, and kauri gum, which has a varnish finish. Graphite and carbon paints have given satisfaction; but it is advised that they should be obtained only from firms of the highest standing.

A New Coal-Tar Antiseptic.

It is reported that the great German manufacturers of coal-tar colouring matters are turning their attention more and more to the production of refined antiseptics prepared from the same inexhaustible storehouse. The latest compound of the kind that has been put upon the market upon a commercial scale has been given the non-committed name of "antinonnin." Its proper name, according to the system of nomenclature followed for products of its class, is potassium orthodinitrocresolate. When this system of nomenclature was first devised for workers in the chemistry of the carbon compounds, the aspiration was indulged in that it might be found possible to keep the new coinage within a seven-syllable limit. This limit has long been extended, which is to be deplored; but since some handy, popular name is usually found for new and complex coal-tar products that appear likely to enter into ordinary manufacturing and domestic use, the evil of too polysyllabic a nomenclature falls only on chemists themselves. The new antiseptic, antinonnin, has been reported upon by Messrs. Harz and Von Miller, who have found it to be the most powerful bactericide known to science. A solution of one part in 1500 to 2000 parts of soapy water is fatal to all injurious plant parasites, without having any deleterious action on the growing plants. The new antiseptic has the additional recommendations of being odourless, and inexpensive. Whether it will fulfil all the expectations formed of it remains to be seen. Meantime, it is admitted to be an interesting, and possibly important, addition to the list of disinfectants.

More Metallic Sodium in Electric Light Conduits.

The remarkable discovery of metallic sodium as one of the unexpected bye-products of electrical distribution by the St. Pancras Vestry, has been paralleled in Boston. The case has been reported on by Messrs. Forbes and Glidden for the Boston Fire Underwriters' Union, and related to the examination of a substance found in the casing of the electric mains in the basement of the Pray building. The report has been published in the *Electrical World*. It appears from it that the substance discovered was in reality impure metallic sodium mixed with partially disintegrated wood; the metallic sodium being the product of electrolytic decomposition of impure sodium hydrate. This sodium hydrate came from the cement mortar used in laying the brick wall of the basement upon which the wires were supported. Some of the hydrate may have worked its way through the wall from the cement used in the foundation of the adjoining paved street. The electric current which caused the electrolytic action was due to a leak inside the casing from one of the mains to another; the leak having been produced by the action of the sodium hydrate on the insulating covering of the wires. Inside the casing, the wires were partially covered by an insulating tubing composed of tarred paper. When the front of the casing was removed, the wires, tubing, and woodwork about this point were found to be covered with a thick liquid, which had dried in places to a whitish substance, resembling discoloured salt, and was slippery to the touch, and strongly corrosive. The metallic sodium was smoking; and, when moistened and struck with any hard substance, it gave off flashes of flame. The substance was determined to be metallic sodium by its appearance and characteristic reactions, and by its colour in the Bunsen flame. The insulation where the deposit occurred was practically destroyed. It is satisfactory to know that the St. Pancras discovery, the truth of which was strenuously denied by certain English electric light journals, has been corroborated.

"The Handling of Dangerous Goods."—If it is truer than ever that "of the making of books there is no end," it is equally true that the manufacture of specialists is a progressive industry. This book, written by Mr. H. Joshua Phillips, F.I.C., F.C.S., and published by Messrs. Crosby Lockwood and Son, is a reminder of the numerous ways in which the public security may be endangered by the handling in, and transmission through, populous places of dangerous and deadly commodities. Accordingly, a new speciality in chemistry has been created, which is devoted to the classification, under the auspices of the railway companies, of explosives and other goods which may be dangerous to handle, carry, or store. Mr. Phillips is an expert in such matters; and his book purports to tell readers what are dangerous commodities, and why. He is a somewhat painful writer, as will be perceived from his remark, in discussing the spontaneous combustion of coal, that the proportions of the constituents of "this well-known and indispensable combustible mineral," as he calls it, "vary greatly, depending as to how complete or otherwise the natural carbonization of the original vegetable matter had taken place." After this, it is not surprising to read that "all coal give off more or less inflammable gases." It is only charitable to suppose that Mr. Phillips is a safer guide in chemistry than among the dangers of English composition. His book ought to be useful to those whom its contents concern.

Crystal Palace Old Students' Society.—The first annual dinner of this Society (which has been formed for the purpose of affording opportunities of mutual assistance and social intercourse to the old students of the Crystal Palace School of Engineering) took place on the 30th ult., at the Holborn Restaurant—the President, Mr. G. M. Lawford, Assoc. M. Inst. C.E., who is Vice-President of the Society of Engineers, in the chair. Old students will be glad to know that Sir Robert Rawlinson, K.C.B., Past-President of the Institution of Civil Engineers, has signified his interest in the Society by consenting to become an honorary member. Unfortunately, Sir Robert was prevented by ill-health from attending the dinner. Mr. S. Green, a Director of the Crystal Palace Company, at whose instigation the Society was founded, proposed the toast of the Society in a very interesting and eloquent speech; and Mr. J. W. Wilson, M.Inst.C.E., M.Inst.M.E., the Principal of the School, also spoke of the great pleasure which the formation of the Society had given him. A selection of music was given after the dinner by members and friends, under the direction of Mr. F. H. Hodson. The Society has been formed only a few months; and already it has over a hundred members. But, as there are at the present time some 1100 students who have paseed through the school, it is hoped that this number will soon be increased, and thus confirm the brilliant prospects under which a beginning has been made. For the information of old students who may desire to join the Society, we may state that the Secretaries, Mr. H. C. Rose, South Tower, Crystal Palace, or Mr. J. C. Lyell, 55, Victoria Street, S.W., will be happy to receive applications, or give any information that may be required.

COMMUNICATED ARTICLES.

NOTES ON CURRENT TOPICS.

By "Veritas."

Perhaps one of the most important investigations of modern times in the domain of gas—embracing, as it does, researches of the very highest scientific character, and which are no doubt eventually destined to have far-reaching results—was the work of the Photometrical Commission on Standards of Light. The result of the investigation, as everyone having any knowledge of the subject would naturally anticipate, was a condemnation of the standard candle, and a recommendation that it be replaced by a more efficient and constant method of ascertaining comparative illuminating values. The labours of the Commission, and the results of their investigations, are now fairly well known; and in face of the evidence, it is curious to observe the tenor of a recent letter appearing in the JOURNAL, and bearing the signature "E. Williams, F.C.S." It is still more curious that this letter has provoked no reply. But the absence of any criticism in the "Correspondence" columns makes it the more necessary to exercise criticism in some other channel.

The statements made in the letter are so strange that they might possibly be regarded as beneath discussion. In the first place, the pentane lamp, by which one may presume the "ten-candle pentane Argand" is meant, is placed in the same category of excellence as the jet photometer and the Methven screen. This is a curious attitude for a presumably scientific gentleman to assume, as it is a well-known fact that the jet photometer is simply a rough practical guide for ordinary working; and that the Methven screen, however useful in itself, is not constant for all grades of gas. The illuminating power of gas supplied to the public should, in the interests not only of the consumer but of the producer, be tested in the most scientific manner, with the highest of skill, and with the most accurate of appliances.

Mr. Williams seems to consider it a mistake for the Photometrical Commission to adhere to the term "candle power." He assumes that, as the Commission were able by the use of candles to obtain a standard of their value, it follows that the body of gas examiners all over the country would be able to use candles successfully in accurately determining the value of the respective gases which they may be called upon to test. In making this assumption, Mr. Williams entirely ignores the fact that the value of the ten-candle pentane Argand, which has been finally accepted by the Photometrical Commission, has been fixed by thousands of experiments made by the most skilful operators; and thus a fair, mean value has been secured. Whatever the actual light assigned to the pentane Argand is, it is at least the mean result of a very large number of careful tests. In addition, the light of the pentane Argand, used under suitable (and easily secured) conditions, is absolutely fixed; whereas, in spite of Mr. Williams's assertions to the contrary, the light afforded by even the best of so-called standard candles is extremely varying, and cannot be controlled by any exercise of skill by even the most expert of gas examiners. Of course, in making this statement, any personal tampering with the standard candle is ignored. Some photometrists advocate a certain amount of manipulation of wicks during combustion; but this is considered illegitimate by the best authorities.

Now, leaving Mr. Williams specifically, and considering more generally the result of the labours of the Photometrical Commission, it is an open secret that, while most authorities are in agreement that the ten-candle standard is a scientific and trustworthy method of estimating all grades of illuminating power, the greatest difficulty in arriving at a conclusion was to fix the actual value of the new standard expressed in candles. There was considerable difference of opinion as to what was the actual light-value of an average candle; and some suggestion was made that the modern candle did not afford as much light in proportion to sperm consumed as the older candle in use when the Acts of Parliament under which the existing Metropolitan Gas Companies are working were originally passed. A compromise has been effected between the authorities acting on behalf of the public on the one hand, and those representing the interests of the gas companies on the other, the effect of which is that the value of the new standard of so-called ten-candle value somewhat exceeds this estimate. The effect of this will be that, if the new standard should ever be accepted for purposes of official testing, the gas companies will not be credited with supplying gas of quite so high an illuminating power as they have been accustomed to under the old *régime* of the standard candle, which has been in vogue for many years past. A compensating advantage would no doubt be found in the fact that the ten-candle standard can be relied upon to give uniform results; whereas the standard candle gives such extreme variations that "good, honest, 16-candle gas" may be officially returned, under the most moderate estimate, as any value between 15 and 17 candles. It may be claimed that, taken as an average, these variations are of little moment; but the unfortunate fact exists that, if the gas of any special gas company is returned at (say) 17 candles, the company get scant credit for the higher illuminating power; whereas if the official return only amounts to 15 candles, the company are subject to a penalty which may reach as much as the sum of £100. One other salient feature about the use of a really reliable standard of light is that it enables different operators to secure fairly constant results. For instance, tests might be taken at a gas company's works, and at an official testing-station on some leading main in the district; and, with skilful operators, the results would fairly agree. Before the Dibdin ten-candle standard can be definitely adopted as the standard of light, it is obvious that parliamentary sanction will have to be obtained; and how long this will take to effect, must be a matter of future history.

It may be interesting to briefly trace the life history of the proposed new standard of light. Many years ago, Mr. William Sugg, whose reputation in connection with gas-burners is so well known, introduced a ten-candle standard. This standard was an ordinary Sugg's "London" Argand, provided with a screen which cut off the upper portion of the flame. Adjusting the flame to a given height, it was claimed that, with ordinary gas, the proportion of light passing beneath the screen afforded a fairly constant illuminating power of 10 candles. This would probably be an accurate standard if the lighting power of the gas only varied within comparatively narrow limits; but a really scientific standard must be independent of any variations whatever in illuminating power. Mr. Methven, whose ordinary standard is an exceedingly useful one for practical working, has recognized this fact. Although not strictly accurate for grades of gas of from 14 to 18 candle power, the ordinary Methven screen affords sufficiently accurate results for all practical purposes when used on gas within these limits. Subsequent to the introduction of the original Methven screen, the inventor has brought forward a modified form, in which the gas employed is passed through a carburettor containing liquid pentane; and thus, whatever the variations in the quality of the original gas may be, an enriched gas of constant light is supplied to the standard—thus rendering it available for testing gas of any ordinary illuminating power.

The Dibdin ten-candle standard is an evolution of the principle of screening off the upper portion of a flame, introduced by Mr. Sugg; and the employment of pentane as an enricher to produce a gas of fairly constant illuminating power, introduced by Mr. Methven. The special credit due to Mr. Dibdin is the development of the combined principles to such an extent as to produce a standard which is now regarded as thoroughly reliable by all experienced photometrists. A very strong point is the use of air as a carrier for the pentane vapour, in place of gas; so that there is always employed a gaseous vehicle of fixed composition, in place of one of varying composition.

Reverting to an earlier period in the evolution of this standard of light, it could not possibly have been brought into existence unless Mr. Vernon Harcourt had previously shown that a certain hydrocarbon known as "pentane" could be prepared with such a reasonable degree of scientific accuracy that, when its vapour was mixed with air in definite proportion, a gas of specific illuminating power could be always ensured. In fact, the fundamental basis of any standard of light depending on the combustion of a hydrocarbon must be that such hydrocarbon can be invariably, and practically, obtained in a state of at least such a degree of purity as to give consistent results under fixed conditions. Pentane meets all these requirements. It is a liquid, and therefore portable; and it is difficult to conceive any other material which could take its place. Although liquid at ordinary temperatures, it is so volatile that it is only necessary to introduce a measured quantity into an experimental gasholder containing air, to produce, in the course of a few hours, a gas of definite illuminating power. Pentane, as originally used by Mr. Vernon Harcourt, was simply employed for the production of a one-candle standard of light. This necessitated the most accurate adjustment of the liquid material to the air employed in a standardized gasholder, and suitable corrections for any deviation from the normal temperature and pressure. In addition to this, the standard flame—unless most carefully adjusted to the exact height—does not afford an accurate degree of light. It was, in fact, found during the investigations of the Standards of Light Commission that even the most skilful photometricians differed in their estimate as to the exact point at which the tip of the flame exactly touched (without exceeding) the platinum wire used for adjustment. This, of course, led to discrepancies, which were aggravated by the fact that, in comparing a one-candle standard against gas of nominally some 16 candles' value, any error in the adjustment of the unit flame was correspondingly augmented.

Subsequent to the introduction of the one-candle pentane unit of light, Mr. Harcourt proposed an alternative method—viz., that of so modifying the proportions of air and pentane as to produce a gas which might be consumed at a fixed rate in the Sugg "London" Argand, and would give a definite light of 16 candles. This system compared with the ten-candle Dibdin standard has again the disadvantage of requiring an accurately prepared mixture of air and pentane with all the combined necessities of scientific skill in operation. The ten-candle standard is free from all the previously mentioned complications. It is true that a gasholder is necessary, but only as a store for a supply of air under pressure. If it were not requisite to avoid irregularities in pressure, an ordinary gas-bag would suffice. No corrections for variations in atmospheric temperature or pressure are necessary; and the only conditions of accuracy

are that the carburettor be kept fairly filled with liquid pentane, and that the flame be maintained at its proper height. Even with regard to the latter detail, a considerable variation may be made—a variation which could not possibly escape the most ordinary of observers—without perceptibly affecting the light afforded by the standard. That is to say, with a material alteration in the height of the flame, the proportion of light passing beneath the screen remains practically unchanged. In pentane, we have a hydrocarbon liquid which can be made to produce a definite illuminating power under fixed conditions; but the preparation of the liquid requires a considerable amount of skill.

It is singular that, following the introduction of pentane as a practical available material, we have had the advent of acetylene. In calcium carbide, there is now available a compound from which practically pure acetylene can be obtained by the simple process of bringing the material into contact with water. Under these circumstances, it is not surprising there are reports as to possible use of acetylene as a standard of light. Considerations as to the best practical method of employment for this purpose must be reserved for future discussion.

THE CAPITAL OF GAS COMPANIES AND OF MUNICIPAL GAS UNDERTAKINGS.

By Norton H. Humphrys, F.C.S., Assoc.M.Inst.C.E.

In some respects it is satisfactory that the question raised in these columns a few weeks since, as to why the capital invested in joint-stock gas undertakings should always be regarded, in the eye of the law, as absolutely irredeemable, while that for municipal gas-works is as invariably considered to be a temporary loan repayable by annual instalments, should attract but little interest or attention. Those lines have undoubtedly been read by many holders of gas stock, whose aggregate investments would represent many millions sterling. Yet no one cares to come forward to claim, on behalf of gas companies, a right to have at least the option of redeeming portions of their capital, and that notwithstanding the fact that corporation gas undertakings are applying part of the profits earned from the consumers of gas for the purpose of reducing the capital thus invested to a vanishing point. It would be difficult to hit upon a better method of illustrating the general confidence in such investments, and in the permanent character of our special industry.

A story has lately gone the rounds respecting a certain corporation—the locality concerned had better not be further indicated than by observing that it is not in the south-west of England—who for some years past have not cared to have their accounts completely audited, as it was well known to those behind the scenes that the result would not be satisfactory. Shareholders in gas undertakings would not go so far as this, for they do not fear a free discussion—there is no reason why they should do so. But at the same time, they probably feel that the tendency of the times is not in the direction of increasing the concessions or privileges granted to gas undertakings. It is rather in the opposite direction, towards the curtailment of those already possessed; and therefore there is no prospect of getting further advantages. The practice is fixed by the law of the land; and any proposition to change it might lead to other proposals being brought forward for alteration. If any company went to Parliament for a re-adjustment of this matter, they would certainly be called upon for concessions in some form or another.

But I do not care to allow the matter to pass, without adding to the protest already expressed. One need not conclude that, because the procedure usual in respect to gas-works capital has been fixed by law, it is thus lifted beyond the pale of discussion. The modern gas-works manager has great faith in the value of discussion—as instanced by the number of meetings that are held for this purpose—and especially in the discussion of matters which, like the one in point, have become questions of procedure. It is no use to gloss over the anomaly created by the fact that a mere accident determines the permanence or otherwise of gas-works capital. If the scrip happens to be headed "—— Gas Company," the investment is permanent and irredeemable; but if the heading runs "The Corporation of —— Gas Undertaking," it is a loan repayable by annual instalments. Yet the status of the proprietors in no way affects the intrinsic value or the practical working of the concern. The consumer buys gas, and will continue to do so as long as it meets his requirements, without any regard whatever to the owners. The manager and his assistants who are responsible for the daily operations, practically follow the same course, whether they are employed by a board of directors or by a gas committee. It would seem that the financial policy of a gas undertaking should be dictated by circumstances more intimately connected with its actual working than the mere accident of ownership; and certainly it is strange that there is no choice between one of two diametrically opposite courses. If a permanent capital is the proper thing, why do corporations seek to write off the capital account? and if a vanishing capital is right, why do not the companies at least have the option of forming sinking funds? The nature of the property represented by the investment, rather than a question of ownership, should determine the permanence or otherwise. At one time, there was a comparatively wide gulf between the financial position of a joint-stock company as compared with that of a municipal corporation; but this is being gradually closed up. The auction clauses have greatly reduced the difference caused by municipal or private ownership respectively upon the profits. There are now joint-stock concerns in which the average dividend as calculated upon the actual paid-up capital, including premiums, is not very much more than that paid upon corporation stocks. It would not be difficult to instance corporations who take more than 8d. per 1000 cubic feet of gas sold for profits, and joint-stock undertakings who take less.

If the proper course in the interests of all concerned is to have a redemption fund, and pay off the capital, why call in the cumbrous aid of the municipal machine for such a purpose? Why have the tedious and costly processes concerned in valuing and transferring the concern, and the numerous disadvantages inseparable from municipal trading? Why not authorize the company straight away to issue redeemable stock, and pay off its own capital? Given a 10 per cent. reserve to commence with, this could be done without injuring the rights of the consumer. The usual reply is that the corporation ownership brings the consumer into the position of a shareholder, and that he at once acquires a partnership in the concern. But there is more fancy than reality here. There is as much distinction between a ratepayer and a gas consumer, as between a shareholder and a gas consumer. The largest sum for rates may be paid by a party residing a hundred miles away; and the heaviest contribution to the gas-rental may come from a non-shareholder. In some gas companies the consumers could carry a vote at any time; and some corporation works are not worked by a majority of consumers. The status of ownership in no way determines the proportion or amount of stock held by consumers.

Some thirteen years ago, at a meeting of the South-West of England District Association of Gas Managers, the writer ventured to question the universal rule of permanent capital for gas companies; and that without any notion of doing away with capital altogether, but simply because it frequently happens that capital must be invested for purposes of a temporary nature, and it thus ought not to pass into a permanent debt. Any loss due to legal expenses, misfortune, or unskilful management—any expense, in short, that does not secure a fair permanent representation in structural value—or depreciation in values due to cheapening of materials or labour, belongs more to the present than to all time. It was shown that, to a limited extent, capital could be reduced without putting an unfair tax on the consumer. The subject, however, fell flat, from which it appears that no one has yet experienced the need for reducing capital. It does not follow that such a need will never become apparent.

We are frequently reminded that Parliament does not allow repayment of capital out of revenue—that is, not to joint-stock companies. It not only allows but forces municipalities to do so. We are told that Parliament only sanctions *fair* profits on capital in addition to actual expenses; but what is a *fair* profit? Forty years ago, a 10 per cent. dividend on shares sold at par was called a fair profit. The legal "fair profit" is a changeable quality, that must be adjusted according to the time of day; and at present, owing to the auction clauses, it is close on to the actual market value of money, or, in other words, close to the lowest rate at which corporations can raise capital. But besides the fair profit, Parliament has always sanctioned a fair consideration for contingencies and renewals. It makes special provision for works on leasehold land, insurance funds, and so on, though these are so rare as to constitute the exception that proves the rule. It has recognized the principle of granting temporary capital for investments of a temporary nature in one or two particular cases; and there would be no inconsistency in extending this principle to include all portions of the investment that are of a temporary or uncertain character.

The general rule is that the capital of a joint-stock gas undertaking should be represented by actual structural value. At present, there is a powerful weapon against extraordinary loss or depreciation, by reason of certain appliances becoming obsolete, in the shape of a wise outlay on renewals; but its utility depends entirely upon a steady increase in business. Take away this condition, and it is nugatory at once. What is the advantage of adding to or enlarging retort-benches, purifiers, gasholders, and mains, if the existing appliances are already ample, or if the demand for gas, instead of going forward, is going back. Money sunk in fighting opposition or in useless plant, may be gradually replaced by extensions provided out of the revenue, if *such extensions are required*. But what if they are not required? Our system of permanent capital not only assumes a universal permanence in the demand for gas, but also a steady increase. So far the facts have, with few exceptions, justified this assumption; but they may not always do so. People cannot be forced to use gas. They have to pay their rates and taxes; but they can have the meter out to-morrow, if they choose. If people will not use gas, or if the population of the district is largely decreasing, what is the use of a parliamentary guarantee? The ordinary County Court summons is of no use to gas companies, as it only secures the payments of debts that can be recovered equally well without it; and similarly, the parliamentary guarantee merely protects a demand that already exists, but does not ensure the continuance of that

demand. Yet some people seem to regard an Act of Parliament as first cousin to the right to collect a poor-rate.

Those who talk about gas companies being slow to move, wanting in enterprise, unable to see beyond their own noses, given to inhabit a particular shell, to walk in one rut, and so forth, do not appreciate the weight of this drag of permanent capital—especially on small undertakings, or in places where trade is bad or the population decreasing. One or two awful experiences in the way of lost or wasted capital are sufficient to unhinge the business judgment of the average director, and to cause him to fall back upon safety before everything. A restriction on reckless expenditure is very desirable; but to be consistent, absolutely permanent capital should not be expended for any but absolutely permanent purposes. I take it that the aid of the renewal account is only recommended as a means of rendering a difficult position more tenable, and not as a permanent resource for those who are contemplating risky investments. Without going away from actual fact, it is possible to show that certain portions of ordinary gas property are not of that absolutely permanent nature indicated by the capital. Suppose a large factory, or a place of amusement, situated at a distance from the works, and that the company are asked to lay a mile or two of trunk main to supply it with gas. After carefully looking into the matter, they decide to spend (say) £1000 for the purpose; and the sum is accordingly added to their permanent capital. But after a time, the owners or occupiers fail; and the place is dismantled. The line of main which cost £1000 is now not worth £100. Again, many gas companies are investing largely in prepayment meters and appliances for letting on hire. The speculative element is always evident in ventures of this sort. A new invention may at any time reduce the value of hired apparatus to somewhere about that of old material. In carrying on the hiring business, great caution is necessary to avoid the accumulation of stock; and after every precaution, occasional losses in this way cannot be avoided. No wonder therefore if many gas directors hesitate about embarking in the hiring business. They do not care to do it with permanent capital; and they feel that to do so out of revenue would be an evasion of their Act of Parliament. It is unfair to compare the policy of gas companies with that followed in other lines of business, where the capital expenditure can be rapidly recouped out of revenue.

There are few gas undertakings that could not with advantage avail themselves of extended privileges in the way of depreciation (which, after all, are nothing but redemption) funds; and, on the other hand, the corporation should carry a fair proportion of permanent capital. I may be reminded that corporations have no right to saddle themselves with permanent capital. If that is so, they have no right to be proprietors of gas undertakings. If they must not incur permanent risks, it is difficult to justify those extending over 30 to 50 years. There is risk in every trading operation, even in the supply of gas. While investments in a corporation, as a corporation free from traders' risks, command a much higher value than joint-stock shares, a trading corporation is no better and no safer than any other company of traders.

Another consideration suggested by the gradual paying off of corporation gas capital, is the effect, as regards neighbouring gas undertakings, when the item of "interest on capital" disappears from the scene. The corporation should then be in a position to sell gas some 20 per cent. cheaper; and the result may be trouble for the gas companies, as the public will not believe that the corporation gas is unusually cheap, but rather that the other is unusually dear. In this connection, the figures quoted by Mr. George Livesey (*ante*, p. 732) are important. During the last ten years, considerable sums have been paid off by corporations; but yet we find that the average capital charges are practically the same as those of provincial companies. So far, the consumer has not benefited much; and I question whether he ever will. Corporation gas undertakings as a rule exist more for the ratepayers and their representatives, than for the consumers. The object is not so much to sell cheap gas, as to get the profits. The consumer may receive a sop or two at first; but when the corporation get into full swing, he is usually told that he ought to be satisfied to pay the ordinary rate prevalent in neighbouring districts, as the profits "go to the town." Already the ground is sufficiently cleared of capital as to leave room for some examples of cheap corporation gas; but where are they? The truth is that a corporation can always get rid of money. Even if there are not one or two unfortunate enterprises on hand, ready to swallow up profits from any source, it is easy to hit on some public improvement that seems indispensable when the money is in hand to pay for it, although no one thought of it or felt its need before. However this may be, the averages do not show that the consumer has so far benefited by corporation ownership.

Cannel Coal in Newfoundland.—A large coal area, 12 miles long and 6 miles broad, has been discovered in Newfoundland, on the new line of railway to the West Coast, and 40 miles by rail from the Bay of Islands. The Geological Surveyor estimates that one seam alone, which is 4 feet wide, contains 11 million tons of excellent cannel coal. Six other seams have not yet been traced. The discovery has caused great rejoicing, as it immensely enhances the value of the railway, and brightens the prospects of the colony.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Quarterly Meeting in Birmingham—Discussion on Prepayment Meters.

We complete to-day our report of the proceedings at the above meeting by giving the discussion on Mr. John Young's paper entitled "Two Years' Experience of Prepayment Meters," (*ante*, p. 875).

The VICE-PRESIDENT said the members must all feel indebted to Mr. Young for the clear information he had given in his paper. The great absorbing question of the day with all gas managers was the introduction, working, and satisfactory collection of the money in connection with the prepayment system. From the remarks the author had made, and the figures he had submitted, it was, in his case, a decided success.

Mr. F. W. CROSS (Wellington) said Mr. Young, in the opening paragraph of his paper, remarked that he should have been glad if they could have had some notes on the experiences of those using a larger number of these meters. In an Association of this kind, the members were quite content to have the experience of such Managers as Mr. Young. The number of meters he had out, or would have out in a short time, showed that the experience was quite sufficient for them. He presumed that, when he referred to larger places, he had in mind the South Metropolitan Gas Company and The Gaslight and Coke Company. But if they had the experience of such Companies, they could not possibly, for an Association of that character, get the knowledge condensed into such a convenient and useful form as he had so ably put before the members. With reference to the point as to the handbills, Mr. Young told them that he had them freely circulated, and that his orders came in slowly. He (Mr. Cross) also had a handbill printed, and circulated it in one street only. He soon had a few meters fixed, and had not circulated any handbills since—the meters circulated themselves. The orders came in quite fast enough for him. His Company was a small one; and therefore they could not go ahead too fast. The author's remarks as to the ordinary consumers decreasing, were rather surprising to him (Mr. Cross), especially when he came to look at the table contained in the paper. There must be certain circumstances in the nature of the locality and the inhabitants that he could not quite understand. The total increase in the meters in 1886 was four; but the new services laid during the year were 206. Therefore Mr. Young must have dropped 202 of his consumers. There must surely be something in the locality that did not obtain in many other places. In regard to the reduction of price, the return of the difference in the money-instead of altering the amount of gas supplied, might be applic, able to Mr. Young's case, where he had a large number of meters; but he (the speaker) thought he should be inclined to alter the meters. It might be that Mr. Young had a variety of meters; but that would not necessitate every meter being brought back to the works. He (Mr. Cross) had three or four kinds of meter; and only in the case of one should he feel called upon to have it taken to the works to be altered and tested. Mr. Young said, in respect to the reading of the meters, that the district was divided into sub-districts; and the meters in a sub-district were never read by the same inspector twice consecutively. That was a very good check; but he went even a step farther. He endeavoured not to get the same meters read twice running by the same man; but, in addition, he had two books. The money was collected monthly. The index was read, and the cash put down, in one book for July, September, and November. That book would be brought into the office; and in August, October, and December another book would go out. Therefore, if there was any deliberate intention to defraud on the part of the meter inspectors, it would soon be found out. They had no knowledge of the state of the index the previous month. In Mr. Young's case, he presumed that the inspector in August would have the book used in the district by the July inspector. He would thus have the registration in front of him; and therefore he could defraud if he wished, and could alter the index in any way. Mr. Young spoke of his collection being made quarterly. He (Mr. Cross) preferred that it should be done monthly. By keeping in touch with the consumers, complaints were minimized to a great extent; so that there was an advantage in taking a monthly rather than a quarterly collection. Consumers left for a whole quarter had time to think over things and accumulate complaints; whereas, if there was a monthly visit, any little difficulty could be at once explained to them. From the papers that had been read on the prepayment system, many little wrinkles could be picked up; and every manager, in starting, should study what had already been done. But in all the papers he had read on the subject, he had not seen any due prominence given to payment on a higher scale. Some meter makers said they could manufacture meters to pass any coin. A shilling seemed to be the regulation coin; and he certainly thought more prominence should be given to shilling-in-the-slot meters. There was a great deal of novelty about penny-in-the-slot meters; but that novelty was bound to work off in course of time. In the winter, too, no doubt many managers would collect from 10s. to 20s. in some of the meters; and there was not the slightest doubt that pennies to that extent would become

rather a nuisance to the householder than otherwise. If managers were wise, they would begin to force, to as great an extent as possible, the shilling meter, because he believed it was the meter that was bound to become popular in course of time. It would give less trouble than the penny meter to both consumer and manager. There was another point in the paper he should like to refer to. Mr. Young said that sometimes a meter which was quite correct when the first two or three pennies were put in, would not give the right amount when twelve were inserted. He (Mr. Cross) would like to have all his meters in that condition; his experience being rather the reverse of that. He found that a great many people "worked" on the first penny. Only the previous day, he had a meter brought into the office, and tested it. He found that the consumer must have been working on one penny alone. He found out that, in place of the 17½ cubic feet which the Company in that case gave for a penny, he could get 20 feet for his first penny. The consumer was working on that penny until he (Mr. Cross) stopped it. Two pennies would adjust the matter; and the consumer would only obtain 35 cubic feet of gas. If he put in anything beyond that up to 10d., he would only get 17½ feet for each penny; but by only taking a pennyworth at a time, he obtained 20 feet. He mentioned this matter because it surprised him; and it occurred to him that it was rather an original game. He thought it would be well for members to watch this matter, as there were many householders who would put in one penny and work upon it. Where they could replace a penny meter by a shilling one, he should recommend that it be done, as there were really more correctness and greater convenience with the shilling than with the penny meter.

Mr. W. W. Hulse (Longton) said he had never spent a single penny in advertising his prepayment meters; and he had now nearly 1000 in use. Of the total number of consumers, about 30 per cent. were burning gas on the prepayment system. Like Mr. Young, they gave 25 cubic feet of gas for a penny, although in his case the price to ordinary consumers was higher—viz., 3s. per 1000 cubic feet. Some time ago, the Gas Committee resolved to allow a discount of 5 per cent. for prompt payment to the ordinary consumers; and in the case of prepayment consumers, the 5 per cent. was handed back to them by the collector. He found, contrary to the previous speaker, that it was an advantage for the collector to have the previous registration in his book. He was also provided with a scale of the price of gas at 3s. 4d. per 1000 cubic feet; and he checked the consumption with the amount of money in the meter at the time of collection. If there was any discrepancy, it was reported to the office, in order that the matter might be rectified. The collector was not the ordinary meter inspector. They were two distinct persons, and had two distinct books; so that the registration of the meters could be checked from one book to the other, and any fraud, if there were any, would thus be detected. They had a number of shilling meters fixed, and found them very useful. He was led to adopt them through one particular consumer, whose meter, unless the money was collected every fortnight, became choked with pennies. He found them useful for places where the gas consumption was greater, such as small beer houses and shops where there was a tendency to run into debt; and they hoped by these means to reduce the item of bad debts. If Mr. Cross had adopted his system of allowing the inspector to have the previous registration in his book, he would at once have detected those consumers who were getting 20 instead of 17½ cubic feet of gas. At Longton, they had had several cases of stealage from the prepayment meters. They found that a number of their meters had been broken open; and this led him to adopt monthly collections. Unlike Mr. Young, he had not many 2-light prepayment meters in use. At first he adopted them; but ultimately he went in for 3-light meters, as the cost was but little more, and the advantages were considerable. In his case, meter-rents had been abolished; and so the excess in the amount collected from the prepayment meters over the amount which would have been realized from the same consumption by the ordinary consumers, was available towards the extra cost of collection and other expenses in connection with this system. Their average consumption worked out very nearly the same as Mr. Young's—viz., about 9000 cubic feet per annum.

Mr. C. Meiklejohn (Rugby) said perhaps some of the members would point out how much was given to the consumers for the amount of capital expended. He saw, by Mr. Young's paper, that the profit, or interest on the investment, was 9·8 per cent. This was practically equivalent to 7d. per 1000 cubic feet, which, he thought, was the difference in the price of the gas. A good deal bore upon the value of this 9·8 per cent.—as to what the consumer was receiving. In Mr. Young's case, as far as he could gather, he simply fixed the meter. He did not see that he supplied anything in the way of fittings, the cost of which, if added to his capital expenditure, would considerably reduce the 9·8 per cent. The only other point he wished to allude to was the reference made by Mr. Cross to shilling prepayment meters. He could hardly agree with his contention in that respect; because the class of consumer it was desirable to gain was, of course, that which was the greatest in number. The penny-in-the-slot meters would always apply to the bulk of the population; while the shilling meters would mainly apply to those consumers who would not feel the meeting of a quarterly account to the same extent as a poorer man.

Mr. Young said that it might open up another branch in the discussion if he replied to Mr. Meiklejohn at once. He did not give the consumers anything, except the meter and service. They were not supplied with any fittings; and it had not been found necessary.

Mr. J. C. Belton (Willenhall), referring to the last paragraph in the paper, said Mr. Young stated that the average consumption per prepayment meter was, in 1894, 8666 cubic feet, and, in 1895, 8818 feet, which was a little in excess of the amount used by the ordinary consumer.

Mr. Young: That is in comparison with the average of the ordinary 2-light system.

Mr. Belton said that was what he intended to ask—whether Mr. Young was referring to the ordinary 2-light or 3-light consumer only?

Mr. W. North (Stourbridge) remarked that he had had some little experience of these meters. In the first place, he should not be disposed to criticize Mr. Young's paper at all, but would simply state his own experience in the matter, and leave it for comparison. They were all beginners in this work; and each of them, no doubt, tried to do the best he could under existing circumstances—they could not all work on exactly similar lines. About the same time that Mr. Young introduced his system, the Local Authority of Stourbridge purchased the gas-works—that was in June, 1893. About a month before that, he obtained three prepayment meters, and put them into the houses of his own men. After the Commissioners had purchased the works, they had an exhibition in the first week of July; and he had six of the meters fixed in the Corn Exchange, with all the lights attached to them—three lights to each. He had not introduced 2-light meters; only 3 and 5 light ones. From the time of the exhibition to now, they had never ceased fixing meters; and by Christmas next—2½ years—they would have about a thousand fixed. They had done but little in the way of advertising; and they had fixed more than one a day since they commenced. The system had been a perfect success in their case, and had given little trouble. He started on a liberal policy, and took rather broad lines. He gave the consumers 25 cubic feet of gas for a penny at the present price, and fitted up their houses free. They did not take the service-pipe into the calculation, as that was put in in the case of ordinary consumers. They gave the prepayment consumers three lights—a pendant and two brackets; and as they supplied 25 cubic feet of gas for a penny (which was 3s. 4d. per 1000 cubic feet, as against the ordinary charge of 2s. 8d.), they obtained 8d. per 1000 cubic feet to cover interest on the outlay and any extra expense. In the quarter ending September, £237 7s. was collected from the meters, which showed that they would get above £1000 in the year. This was all new business, with the exception of about half a dozen people whom they did not care to trust—the tenants of little public houses, for instance. They refused to pay a deposit; and so he put in slot meters. Some of the old consumers asked for slot meters; but he would not let them have them. As to the returns, in order to check them, last quarter they worked out the amount of money they ought to have received for the total consumption registered by the slot meters; and it was found they were a few shillings to the good on the whole transaction, which indicated that the meters were working very correctly. They had at that time 800 of the meters fixed; and now they had 846, with 138 on order, so that they would easily make the number 1000 by Christmas. They had had two cases of tampering with the meters. In one, the bow of the lock was filed in two; and in the other, the money did not correspond with the state of the meter. In the latter case, they had a special lock made for the consumer; and the deficiency had not occurred since. His Committee were perfectly satisfied with the way the consumers had been dealt with; and he was convinced that the more liberally they could treat them, the better the system would succeed. He did not think there was anything in the paper he should care to criticize. Circumstances varied in every place; and Mr. Young was fortunate in having got his business without dealing so liberally as he (Mr. North) had had to do. So long as Mr. Young could do that, he should say, "Go on, and prosper." Districts, however, differed; and the inhabitants differed. He was of a strong opinion that they would not have obtained half the number of consumers they had done if they had proceeded under Mr. Young's plan. He would fit up a house free rather than lose a customer; for the more gas they had to make, the cheaper they could produce it. New business was a very desirable thing to have. The standing charges remained the same; and the little additional expense for collection was covered by the extra 7d. or 8d. per 1000 cubic feet sold. They chose as their meter inspector a man who had been on the works twenty-seven or twenty-eight years; and they did not go to the trouble of checking him as some of the members did their inspectors. They collected every month; and from some of the meters they obtained as much as 17s., 18s., and even 20s., so that they would not run a quarter without being choked up. He could scarcely agree with Mr. Cross respecting the shilling meters. With such meters, they would be cultivating a higher class of consumer altogether. The working man was what they were going for; and for him the penny-in-the-slot meter was the most suitable. As he had remarked, some of his old consumers had asked for slot meters. They would come to him and say: "I want a slot meter." He would ask: "Do you call yourself a working man?" and the reply was something to the effect that "I should

not like to be classed as one," upon which he (Mr. North) would remark: "Then don't have a slot meter." This, he found, was the best way of settling the matter. (Laughter.) To push the shilling meters was a mistake, as they would not appeal to the class of consumer the prepayment system was introduced for. It was intended to capture the working class; and he knew, by experience, that they had hitherto failed to get that section of the community as consumers. There were three things that kept them back. In the first place gas companies would not trust them; secondly, they could not afford to fit up their houses themselves; and, thirdly, they could not afford to pay a deposit. Now gas companies and gas committees had met them with the prepayment meter; and having obtained a footing among them, gas managers must do their utmost to make the system a grand success.

Mr. YOUNG, in replying to the discussion, said that Mr. Cross had spoken of the peculiarity of the district supplied by the works under his (Mr. Young's) charge, and of the number of consumers decreasing. They had, and most manufacturing districts had, a shifting population. The people were keen enough to come in during the winter time; but directly the light weather came, they would fly off again. In places of that kind, people would often burn gas, under the old system, for a quarter or two; and then, when the bill came in at the end of the quarter, they would find it amounted to more than they had been able to save. The British working man was not, as a rule, of a very saving disposition; and it was a bit awkward for him to have a bill for gas and the demand-note for his rates coming in at the same time. Then he would have the gas cut off; and this was the reason why the actual increase in the number of consumers was so small in a district like his. The introduction of prepayment meters had obviated this; and the working man showed his approval of the system, and was pleased to do so, especially since the price of oil had risen. With reference to the point as to the alteration of the meters on a reduction of price, that would involve a considerable amount of difficulty, because there were a good many of the meters he would wish to have tested if any alteration were made. Any little discrepancy that occurred now between the amount of gas shown by the index as having been consumed and the amount of money in the box, was easily adjusted. They were always something to the good; and therefore they could afford to return to the consumer the difference in the price, after having seen that the money was correct. This was rather a favourite method with the consumer himself. He liked to get his "bit" of money at the end of the quarter. As to Mr. Cross's system of two books for the registration of the meters, Mr. Hulse had said something upon the point; and he (Mr. Young) could not see how Mr. Cross's man could have any check on the amount of money found in the meter when he was not in possession of the last index—he could not check it until he returned to the office.

Mr. CROSS: It has nothing to do with the collector whether the cash is right in the box or not; he has simply to hand in the cash and his book to the office.

Mr. YOUNG (proceeding) said that Mr. Cross had also remarked that monthly collections kept him in touch with consumers, and enabled complaints to be attended to. In his (Mr. Young's) case, few of the meters required a monthly collection. As to complaints, the consumers, whether there was a monthly or quarterly collection, were keen enough upon complaining if they had anything to complain about. It made rather a serious item in wages alone, if they had men perambulating the district making monthly collections. Regarding shilling-in-the-slot meters, in the case of some public houses, shops, and so on, where they might have had difficulty in the old days to get the money, and had had to threaten to cut off the supply, these meters were very useful. Mr. Hulse had stated that 30 per cent. of his consumers were on the prepayment system; but he had not informed them how many of his old consumers were now supplied in this way.

Mr. HULSE: About two-thirds of the consumers on the prepayment system are new.

Mr. YOUNG said the question of fittings was rather an awkward one. There were two sides to it. If they were going to codle up the new consumers, they ought, in fairness, to fit up the houses and even mills of those who had been good consumers in the past. The 8d. per 1000 cubic feet would not necessarily cover the cost of the fittings. If the consumer was burning a fair quantity of gas, 8d. per 1000 feet was a very good return. It was true that the cost of the fittings on the prepayment system was not very large; but, at the same time, it was difficult to see why they should not extend certain privileges to the old as well as to the new consumers. This was a question that each manager must decide for himself. He should like to ask Mr. North whether, if the fittings were already in the house, he gave the consumer more gas, because otherwise it would not be fair.

Mr. NORTH: I wish you would not ask such close questions. (Laughter.)

Mr. YOUNG concluded by thanking the members for their attention, and especially those who had taken part in the discussion.

[The remainder of the business was reported in the JOURNAL for the 29th ult., p. 876.]

THE COMMERCIAL VALUE OF PHOTOMETRY.

(*Continued from p. 924.*)

We have now to meet another line of attack. The claim has been repeatedly made that some kinds of light possess greater "diffusive" power than other kinds; that there was here a departure from the law of distances; and that this departure was easily apparent to the unaided eye. If this were so, it would necessarily be because the light from some parts of the spectrum penetrated distance better than from other parts. Generally the statements in this connection have been most indefinite as to argument, but none the less positive on account of that weakness.

One gentleman, prominent in our discussions eight years ago, did, however, back up his position as an advocate of differences in "diffusibility" by stating that "we know that the yellow rays have greater diffusibility, and take up more room in the spectrum, than the lighter and whiter rays." It was contended that a 16-candle coal-gas light gave fully as great an illuminating effect as a 20-candle water-gas. Generally this was coupled with the statement that the light from the water gas was less diffusive on account of its "greater intensity," or on account of the flame being whiter.

This was made the point for discussion in a paper entitled "Illumination *versus* Candle Power,"* which I had the honour to read before this Association at its meeting in 1887. In that paper, I detailed the results of a series of careful experiments in which the "diffusive" power of the lights from a coal-gas flame, a water-gas flame, and a Welsbach lamp were compared. The coal gas was of 16·5, and the water gas of 23 candle power. In these experiments, the disc was set at the centre of a long table, and the burners were put at equal distances on each side of the disc, and then adjusted to give equal intensities of illumination. The burners were then moved out each one foot from the disc, and another reading made. This was repeated foot by foot, until the burners were so far removed that the illumination on the disc was reduced too low for satisfactory work. The readings remained practically constant. This proved that the light from the whiter water-gas flame and from the still whiter (or greener) Welsbach, carried as well as the light from the yellower or redder coal-gas flame.

The recent discussions in England have been as to the relative illuminating power of flames of the same candle power. It has been claimed that the flame from a low-candle gas gives a more diffusive light than the flame of higher-candle gas. But there has not been a close agreement as to the reason for this; some contending that this claimed superiority of the low-candle flame was due to lower intensity, and others that it was due to a whiter flame.

This claimed difference in diffusibility or carrying power was also particularly referred to more than once in the discussion of Mr. Newbigging's paper on "Illuminating Power and Illuminating Effect,"† in connection with the comparison in lighting effects of a gas-flame and a kerosene-oil lamp. As in our discussions, where gas and electric lights were compared, the claimants for greater diffusibility were here willing, as opposed to a common competitor, to claim the advantage for gas without specifying its kind.

The kerosene-lamp light is spoken of as being "less in quantity," "of greater intensity," "more concentrated and localized." Shop windows having brilliant illumination showed no diffusion outside the windows, as compared with gas-lighted windows, &c. The kerosene-oil flame being quite different in character from either a coal-gas or a water-gas flame, I determined to test the relative carrying power of the lights from these flames. Through the courtesy of Chief Engineer Bradley and Dr. Elliott of the Consolidated Company of New York City, I was able to make the tests at their Twenty-first Street laboratory, where both water gas and coal gas is on tap. The oil-lamp used was the "Belgian," and gave about 35½-candle power; the coal gas was of about 16-candle, and the water gas of about 27-candle power. The same arrangement as in the experiment of 1887 was employed; sufficient gas in each case being burned to balance the light of the lamp when the first reading was made. Dr. Elliott and his assistant agreed with me that this test failed to discover any difference in carrying power or diffusibility.

The only warrant which I have been able to discover for a belief in any difference in this direction is in a minor point mentioned by Captain Abney and Professor Palaz. Captain Abney says that, in the case of low intensities of illumination, the eye is less sensitive to impressions from the lower, or red, end of the spectrum than from the parts higher up, and especially from the green. The difference is discoverable by illuminating a disc with red and green lights of equal intensities, and then moving the lights away. The green light will keep the disc illuminated for a greater distance.

If there were a material difference in this regard, white light, being composite, would give a different resultant colour to the eye as we receded from the source, by reason of the retina failing to respond to the red rays equally with those from higher in the spectrum. If there is a difference in effect upon the retina, it goes to demonstrate how completely we may be deceived by

* See JOURNAL, Vol. L., p. 970. † *Ibid.*, Vol. LXIII., p. 1219.

crude observations of lighting effect made without the opportunity for measurement of quantities; for the advantage as to greater carrying power has in America invariably, and in England generally, been claimed for the light containing the greater proportion of the red rays.

The impressions obtained, even by experienced gas men, from these crude observations are apt to be more fanciful than valuable. We can by the eye tell if a lighting effect is pleasing, or if the illumination is of a character to enable us to perform our tasks fluently. But we cannot, even approximately, so measure and compare the means employed to give the illumination observed. If in such comparisons we accept the advertised statements of candle-power values of the light-sources, the responsibility for which statements is unfairly charged to the much-abused photometer, then we are simply inviting self-deception.

It is to be noted that the men who claim the ability to make these "practical" comparisons are often the ones who express the most contempt for the values determined by painstaking photometrical observations. Such practical observations are of no value unless we obtain the number of the light-sources, and can estimate the candle power of each and the plan of distribution. We still have to account for the differences in surroundings, especially as to the relative powers of absorption and reflection of the surfaces involved. One rough test which has a value is, I think, but seldom employed—viz., the reading of different sizes of type at a given distance.

Let me, as briefly as possible, remind you of some of the reasons for the eye's inability to estimate illuminating values by simple inspection. The impression of illumination which we receive is caused by excitation of the retina. This impression is not in proportion to the visual intensity energy, nor is it even in proportion to the actual illumination developed. A given amount of energy developed into visual intensity energy will furnish widely different results for the different parts of the spectrum. Taking dark red as 1, the yellow will be 28,000; the green, 100,000; the blue, 62,000; and the violet, 1600. But this concerns us more in connection with the economical production of light than in connection with the comparisons between the lighting values of certain light-sources, no matter how or at what cost produced.

But even here we must always bear in mind that lighting values are arbitrarily determined by the retina. If a surface is illuminated with a certain intensity, the practical result is not in proportion unless the effect on the retina is in proportion. But the retina does not act alone; the adjustable diaphragm, the iris, co-operates with the retina to prevent, as far as possible, too violent and sudden excitation of the former. If this protection is insufficient, then the retina is rendered temporarily incapable of appreciating the value of a given impression. This paralyzing effect is produced by too great an intensity of illumination; by abrupt variations in the degree of illumination; and, more than all, by the direct rays from a light-source of great intensity. Familiar examples of this effect from each of these causes instantly occur to all of us.

(To be continued.)

THE CHEMICAL PURIFICATION OF ILLUMINATING GAS.

In the notice of the proceedings at the annual congress of the Société Technique which appeared in the JOURNAL for July 23 last, it was mentioned that one of the papers submitted in competition for the Society's premiums was on "The Chemical Purification of Illuminating Gas;" the authors thereof being MM. Delseaux and Renard. The full text of the paper has been published in the *Journal de l'Eclairage au Gaz;* and, as the Committee of the Society deemed it worthy of a prize of 750 frs., we give a full abstract of it.

The authors introduce their subject by remarking that purification may justly be considered as one of the most important branches of the gas industry; and the aim of those engaged in it should, they think, be to have a system which not only ensures the extraction from the gas of the greatest number of its injurious properties, but utilizes them in the production of bodies possessing a certain commercial value. The operation of purification may be divided into two branches—mechanical and chemical; the former comprising condensation, and the latter including washing and dry purification. On leaving the hydraulic main, the gas contains tarry vapours, the condensation of which is important from the point of view of the separation of naphthalene and of the richness of the gas in benzol; ammoniacal salts, which have a corrosive action, and produce, in burning, deleterious gases; sulphuretted hydrogen and other sulphur compounds (the impurities to which the greatest importance is attached in the contracts entered into between local authorities and gas companies); cyanide compounds, which in combustion throw off carbonic acid; and, finally, carbonic acid itself, which not only largely diminishes the light-giving power of the gas, but vitiates the atmosphere. Carbonic oxide may be regarded as an impurity; but so may all the other gases other than the light-giving hydrocarbons, considered from the point of view of the luminous intensity of the flame produced by the combustion of the gaseous mixture. Still, the question of the removal of the carbonic oxide has been raised, probably on account of the large proportion of carbonic acid which this gas produces in burning, as well as of the dangers arising from escapes. But the authors think the latter are not very serious; while the removal of the impurity would cause more trouble than it would be worth.

Having given, in a tabular form, the composition, at various parts of the apparatus, of the gas experimented with, the authors take up the subject of condensation. They advise that the gas, on leaving the hydraulic main, should be allowed to flow on slowly, and be kept at a temperature of about 140° Fahr. in the collecting-main. Under these conditions, only some of the tarry vapours are condensed. The rest carry along with them but a small proportion of benzol; that which remains serving to arrest the naphthalene in the condensers proper. The temperature of the gas should be rapidly brought down to about 60° Fahr. when it reaches the tar-extractors or the condensers acting by impingement, which appliances should always be placed between the exhausters and the washers.

Taking up next the subject of washing, the authors explain that its chief object is to extract from the gas the ammoniacal salts contained therein. But they point out that, in removing these, other bodies are removed in varying proportions—some of them performing useful functions in the composition of the gas, while others are injurious, and would have to be got rid of at a subsequent stage. The efficiency of a washer depends alike upon the apparatus employed and upon the temperature at which it is worked. The operation should not be pushed too far, to the detriment of the illuminating power of the gas, especially when working under the most favourable conditions—that is to say, at a low temperature. A return to the use of metallic solutions for washing gas has been witnessed of late years; and a patent has been taken out for the United States by Mr. W. L. Rowland, of Philadelphia. It consists in adding an iron salt to the water employed to take out the ammonia; completely arresting the cyanogen, and forming a soluble compound of ferrocyanide accompanying the ammoniacal salts. The ferrocyanide, after having driven out the ammonia by the ordinary processes, is transformed successively into ferrocyanide of calcium, double ferrocyanide of calcium, and potassium; and then, after treatment by alkaline carbonate, into alkaline ferrocyanide which is crystallized.

The authors now enter upon the real subject of their memoir—viz., the chemical purification of gas; and they divide their work into three sections: (1) The operation and the materials employed therein; (2) the revivification of those materials; and (3) spent materials.

Dealing first with the operation, the authors remark that prior to it the gas contains as impurities sulphur compounds, hydrocyanic acid, and carbonic acid. The part played by chemical purification has for a long time been to rid the gas of those properties which should not be contained in it, especially sulphuretted hydrogen. But the removal of the other two acids is as important from different points of view—one especially being injurious to the illuminating power of the gas, and the recovery of the other reducing, in greater or less proportion, the cost of purification. The various materials which have been employed for purifying gas—lime, natural oxide, oxide of iron, Laming material, &c.—are touched upon; and then the authors proceed to consider their affinity for hydrosulphuric and hydrocyanic acids when working under the same conditions, and endeavour to ascertain what would be the influence of different causes—such as temperature, moisture, speed, &c.—on the process of revivification. They summarize what has been written upon this subject; adding the results of their own personal investigations.

The first material to be considered is oxide of iron; this being the one now most employed. It is found in a natural state in the anhydrous or hydrated form. This difference in its composition—viz., the hydration—is a rather important matter. According to Brescius, dry sulphuretted hydrogen, which does not act upon anhydrous oxide of iron, reacts, with a rise in temperature, upon ferric hydrate; humid gas acts only incompletely upon anhydrous oxide. Mr. Lewis Thompson explained the maximum of power of the oxide, after three or four passages in the purifier, by the fact that the oxide is at first in the hydrated condition, and passes into the anhydrous state, which has more effect in purification. Others have come to the conclusion that the oxide should be hydrated in order to act upon sulphuretted hydrogen—that is to say, that anhydrous oxide is of no use for the purification of gas. In agreement in this respect with the opinion expressed by Mr. John T. Sheard, the authors consider that sulphuretted hydrogen acts upon both anhydrous and hydrated oxide of iron; and that if the action is less rapid in the former case, the activity continues longer. They, however, acknowledge the presence of hygrometric water in the reactions.

The natural oxides of iron may, from a mineralogical point of view, be divided into anhydrous and hydrated. The kind most in use for the purification of gas is bog ore, which is very plentiful. As supplied to gas-works, the stuff is in a more or less compact state, and cannot be used as received, but has first to be pulverized. The molecular condition in which it is submitted to the stream of gas is a matter of much greater importance than is generally supposed. Three experiments were made by the authors with dry hydrated oxide—the first with

the material in fine powder; the second, with it in small grains; and the third, with it in larger pieces (0·2 to 0·3 inch in diameter). The result showed that the granular is better than the powdery condition; but in most gas-works on the Continent, a little sawdust is put with the oxide to absorb any moisture. Whatever inert material may be added, however, it should only be in such quantity that the gas easily passes through the mass, as when in use it increases in bulk by the formation of free sulphur. The quantity of hygrometric water contained in the oxide exercises considerable influence, not only in regard to the reaction, but to the caking of the material. In point of fact, there can be no doubt that a dry oxide will become clogged more easily than a wet one, and will consequently offer greater resistance to the passage of the gas. It must not be supposed, however, that a material should contain a certain percentage of water in order to have its maximum of effectiveness. Mr. Sheard thinks that, as a general proposition, oxide which has the least moisture is the most efficacious. But if humidity is necessary, it must not be present in too great quantity.

The authors next describe in detail the reactions which go on in purifiers; studying successively the action of sulphuretted hydrogen and hydrocyanic acid upon oxide of iron. They acknowledge the difficulty, if not impossibility, of getting an exact idea of these changes, owing to the diversity of the gases acting upon the complex mixtures of oxides of iron. They therefore rely upon laboratory experiments with pure gases acting separately and mixed upon pure oxide; all possible precautions being taken that these operations should be carried on in neutral atmospheres—*i.e.*, not liable to be affected by the outside air. Full particulars of these tests are given. The authors point out that the reactions described vary according to the rate at which the gas passes through the oxide, the time of contact, temperature, the hygrometric condition of the gas, and its more or less perfect washing. These matters are successively considered. Speed should be proportionate to purifying surface. Mr. Crisfield, of Savannah, has shown that the useful surface for the passage of the gas should be about one-third of the total volume of the oxide. This gentleman considers that the most advantageous time of contact is 48 seconds. The results of two experiments are given to show that prolonged contact favours the formation of cyanides of iron. As to the bulk of material to be employed, the most economical result is obtained when it is 1-20th that of the gas passed in an hour. The time of contact being proportionate to the thickness of the layer of material, the authors consider it would be advisable, if the total mass of oxide became changed into sulphur, to make the layer as high as possible.

The purifying material is employed, according to its density, in one or in several layers. The authors think that, with a material weighing from 56 lbs. to 64 lbs. per bushel, a single layer would be preferable. Using one 24 inches thick, the test showed 15·65 per cent. of total sulphur, and 11·75 per cent. of free sulphur; while with the material employed in four layers 6 inches thick, they showed 14·96 and 9·03 per cent. respectively. The authors claim that their views accord pretty nearly with those of Mr. Hawkins, who is of opinion that the best way of using oxide of iron is in layers 18 inches thick, two layers in each purifier. The consolidation of the material may be affected by the disposition of the inlet and outlet pipes to the purifiers—in other words, by the direction of the current of gas through these vessels. The authors think it should pass from the lower part upwards; but a more efficacious utilization of the material is obtained in those purifiers in which the current is reversed.

The hygrometric condition of the gas evidently has some influence upon the intensity of the chemical reactions. For example, dry sulphuretted hydrogen does not act upon oxide of iron deprived of all trace of moisture. This is the case not only with oxide of iron, but with other bodies, such as acetate of lead, lime, magnesia, or baryta. This condition affects also the arrest of the hydrocyanic acid in the purifiers—a fact which may be easily accounted for, seeing that without humidity there would be no formation of sulphide of iron. In manufacture, gas is considered to be constantly saturated with moisture, inasmuch as, in the course of its passage from the hydraulic main to the holder, it is in the presence of water in its most efficacious state—viz., as a liquid and not as vapour. Though the temperature of the gas may be lowered, it will still be saturated with humidity; but as soon as there is a rise of temperature, the hygrometric condition is heightened. Temperature, consequently, has an important bearing on purification; and this matter the authors next deal with. The fact of purification being more efficient in summer than in winter might, they remark, lead to the conclusion that the higher the temperature the better will the material work. But this is not so. There is a maximum temperature at which the reaction does not take place; and this maximum varies for each kind of oxide. Some experiments were carried out by the authors to ascertain the effect of different temperatures on the same kind of oxide, anhydrous and hydrated; and the results are tabulated. Speaking generally, as far as the removal of sulphuretted hydrogen is concerned, natural oxide of iron is more active hot than cold; and if a certain determined temperature could be maintained for each kind of oxide, the reactions would be favoured. What has been said with regard to natural oxide applies equally to all mixtures having oxide of iron as their basis. In practice, the difficulty of maintaining this temperature is increased by the heat which is thrown off by the mass of material while it is at work—heat which does not attain its maximum till the stuff has been two or three times in the boxes, and diminishes as it becomes spent.

The authors next pass on to consider the effect of the more or less perfect washing of the gas—in other words, the presence in it of a variable proportion of ammonia—on the process of purification. Being desirous of ascertaining what would be the effect of introducing ammonia into washed gas before it reached the oxide of iron, they first caused the gas to pass into an atmosphere charged with ammoniacal vapours; and then employed gas which was free from every trace of ammonia. The results appeared at first to contradict those arrived at by MM. Aguitton and Debenoist, who investigated the matter a few years ago, and communicated the results to the Société Technique in 1889. They showed that the absence of ammonia from the gas reduced the sulphocyanates, but augmented the ferrocyanates, in the material; and that if the total quantity of cyanogen retained in the two cases were calculated, less would be found in the latter. They therefore came to the conclusion that the effect of the absence of ammonia was to render a portion of the oxide inoperative, owing to the formation of prussian blue, and that consequently its purifying power was considerably diminished—to the extent, in fact, of 32 per cent. In the authors' experiments, the oxide through which the gas freed from ammonia had passed contained 22·41 per cent. of sulphur, 0·44 per cent. of sulphocyanic acid, and 2·40 per cent. of prussian blue; that through which had passed the gas charged with ammoniacal vapours contained 20·26 per cent. of sulphur, 1·85 per cent. of sulphocyanic acid, and 6·75 per cent. of prussian blue. But it is pointed out that the two currents of gas were equally well washed, and consequently they contained the same quantity of hydrocyanic acid. MM. Delseaux and Renard found, like their predecessors, that the largest quantity of cyanogen is retained when ammonia is present. But if the latter increases the formation of sulphocyanates, it also augments the cyanides; and, regarded from this point of view, it would act more efficiently in the last purifiers, where sulphuretted hydrogen is no longer present.

The authors now come to the subject of purification by lime, their remarks on which will be noticed in a subsequent issue.

Southern District Association of Gas Engineers and Managers.—The next general meeting of this Association is to be held at the Holborn Restaurant on Thursday, under the presidency of Mr. S. W. Durkin, of Southampton. We learn from the circular issued by the Hon. Sec. (Mr. J. W. Helps, of Croydon), that after the formal business, which will include the election of officers for the ensuing year, Mr. C. C. Carpenter will read a paper on "Gas Condensing and Exhausting;" and Mr. A. E. Broadberry will deal with "Cleansing Spent Oxide." These matters having been discussed, the members will consider a letter which has been received from the Hon. Sec. of the South-West of England District Association, in regard to the proposal for amalgamation which was brought forward at the last meeting of that body.

The Dangers of Trolley Wires.—Last week, we commented on the report of Major Cardew on the subject of the accident on the electrical railway at the Giant's Causeway, and mentioned that the Inspector had recommended the removal of the rail charged with electricity, and the substitution of an overhead system placed at a height of not less than 8 feet from the ground. It is quite as well that the distance was specified, as in the event of the cable sagging, other troubles might have ensued. A short time ago, a preliminary test was made of the trolley cableway for the propulsion of boats on the Erie Canal at Tonawanda, under the direction of Mr. Frank W. Hawley, the President of the Cataract Construction Company of Niagara Falls. It appears that, after the current was turned on, the motor moved along the canal for about 220 yards, when the cable sagged under the weight of the motor, and the latter touched the ground. Flames immediately shot out and enveloped it, blazed for a couple of minutes, and then died out. With this the preliminary test came to an end. Mr. Hawley stated that it would be necessary to procure machinery to prevent the cable from sagging before any more tests could be made.

Flame Temperature and the Acetylene Theory of Luminosity.—At the meeting of the Chemical Society last Thursday, Professor Smithells read a paper on this subject. It was devoted to a discussion of the acetylene theory of luminous hydrocarbon flames which was originated by Professor Vivian B. Lewes. As the result of experimental and critical examination, Professor Smithells expressed himself entirely opposed to the theory. In the first part of the paper, the author recorded some experiments made with the platinum and platinum-rhodium thermo-couple of M. Le Chatelier; and he showed that, even when special precautions are used in applying the instrument to flames, erroneous results are very likely to be obtained. The arguments which Professor Lewes had used, based on temperature measurements, on the comparison of hydrocarbon flames, on the peculiarities of the flame of pure acetylene, on the behaviour of cyanogen, and on theoretical considerations of a thermo-chemical kind, were in turn examined and rejected. Finally, Professor Smithells gave reasons for believing that the older view of the structure of flames furnishes a better explanation of their luminosity than the acetylene theory.

A TABLE FOR EQUALIZING GAS-PIPES AND BRANCHES.

In the JOURNAL for Oct. 29 (p. 874), we gave a new suggestion, due to Mr. Arthur H. Crump, in regard to the determination of the flow of gas in pipes. There has recently come to hand another statement relating to the same subject, emanating from the Norwalk Iron-Works Company (of America), and originally given in a pamphlet of theirs entitled "A Few Facts Concerning Machines for Pumping Natural Gas." This statement runs to the effect that the common idea as to the carrying capacity of a pipe being in proportion to its internal area is not well founded. A pipe 4 feet in diameter has only four times the area of a pipe 2 feet in diameter; and yet the 4-feet pipe will carry 5·66 times as much fluid as the 2-feet pipe, under the same conditions of length and head. In other words, a 2-feet pipe will only carry 17·6 per cent. of the discharging capacity of a 4-feet pipe. This proportion of carrying capacity does not hold good for smaller pipes of the same ratio of diameter. A 12-inch pipe has only 16·6 per cent. of the carrying capacity of a 24-inch pipe; and a 1-inch pipe will only carry 14 per cent. of the capacity of a 2-inch pipe. It is remarked that these features have not heretofore been taken into consideration in tables prepared for equalizing pipes. The proper values are given in the table below. In this table, the commercial or nominal size of pipe is given; but, in calculation, 1¼-inch pipe was taken as 1·3 inch diameter, and 1½-inch pipe as 1·6 inch, as these are nearer the actual sizes. The size of pipe is given in the top horizontal line; and directly underneath is shown successively the proportion of its capacity that other sized pipes will carry—these sizes being given in the left vertical column. From the table it appears that a 6-inch main can have 15 per cent. of its capacity taken off by a 3-inch pipe, 23 per cent. by a 3½-inch pipe, 34 per cent. by a 4-inch pipe; and also that a 24-inch pipe carries 38 times as much gas as a 6-inch pipe.

In taking branches off a main, it is declared to be advisable that the sum of the percentages of the carrying capacities of all the branches should be 100 per cent., or more. Turning again to the table, for an illustration of this rule, and referring once more to the 6-inch main, it will be seen that, if this main is divided into two branches, 4 inches and 5 inches in diameter respectively, the carrying capacities of these branches would only be 34 per cent. and 64 per cent. of the trunk main. Thus provision would be made in this way for only 97 per cent. of the original flow; and consequently there would be slight additional friction from the point of diversion of the branches. If the branches are made 4½ inches and 5 inches respectively, their combined carrying capacity would be 110 per cent. of the original main; and hence the flow of gas would be considerably freer than in the former case.

Relative Carrying Capacity of Pipes for Gas.

	1	1¼	1½	2	2½	3	3½	4	4½	5	6	7	8	10	12	24
1	1·00	0·48	0·27	0·14	0·07	0·05										
1¼	2·10	1·00	0·55	0·29	0·16	0·10	0·06									
1½	3·70	1·80	1·00	0·53	0·29	0·18	0·11	0·08								
2	7·14	3·40	1·90	1·00	0·53	0·33	0·21	0·14	0·10							
2½	13·40	6·30	3·50	1·90	1·00	0·63	0·40	0·27	0·20	0·15						
3	21·40	10·30	5·70	3·00	1·60	1·00	0·67	0·43	0·32	0·23	0·15					
3½		16·10	9·00	4·70	2·50	1·50	1·00	0·68	0·50	0·38	0·23	0·15				
4			13·10	6·90	3·70	2·30	1·40	1·00	0·71	0·56	0·34	0·23	0·15			
4½				9·60	5·00	3·10	2·00	1·40	1·00	0·77	0·47	0·31	0·21	0·12		
5					6·70	4·40	2·60	1·80	1·30	1·00	0·63	0·42	0·28	0·16	0·10	
6						6·50	4·30	2·90	2·10	1·60	1·00	0·66	0·45	0·26	0·16	0·03
7							6·50	4·40	3·20	2·40	1·50	1·00	0·71	0·40	0·24	0·04
8								6·50	4·70	3·50	2·20	1·40	1·00	0·59	0·36	0·06
10									8·30	6·30	3·90	2·50	1·70	1·00	0·61	0·10
12										10·30	6·30	4·10	2·80	1·60	1·00	0·17
24											38·00	24·00	17·30	9·60	6·00	1·00

The Flow of Liquids in Channels.—Messrs. W. Santo Crimp and C. E. Bruges have produced a new formula for determining the flow in water-mains and sewers; and they have explained it in a contribution to the "Proceedings" of the Institution of Civil Engineers. Chezy's formula is $v = c\sqrt{rs}$, where v is the mean velocity in feet per second, r is the hydraulic mean depth, s is the surface inclination, and c is a co-efficient. The new formula is $v = 124\sqrt[3]{r^2}\sqrt{s}$; and its merit consists in the fact that only one co-efficient is employed for all sizes of channels, if they are constructed of good brickwork or cast iron. The formula has been practically tested; and it has been shown to give very trustworthy results.

The Proposed Adoption of the Metric System in England.—In the course of his address at the opening meeting of the new session of the Royal Institute of British Architects, the President (Mr. F. C. Penrose) alluded to the proposal to adopt the metric system of weights and measures in England. He said he thought the change would introduce certain far from unmixed advantages, and be attended with enormous trouble. He ventured to suggest, as an alternative to "swallowing the metric system as a whole," a plan which would, in his opinion, give all the advantages of that system with less than a tithe of the disturbance. If the inch were reduced in length by one hair's breadth, 10 of such inches would be equal to 25 centimetres, which is equivalent to the Italian *palmo*. He therefore recommended the word "palm" to denote a length of 10 inches, which would serve for general use instead of "foot." In dealing with those nations which have adopted the metre, it would be only necessary to multiply or divide by four, as the case might be—that is, divide a measurement given in metres and centimetres by four to bring it to English palms and inches, or multiply English palms and inches by four to bring them to the metrical scale. Weights and measures of capacity could be dealt with in an analogous manner by an almost insensible alteration of the ounce or the pound, the pint or the gallon; though the necessity in these probably would not, he thought, be so great, because the kilogramme and litre are considered more reasonable standards than the metre.

The Prevention of Smoke Arising from Intermittent Firing.—At the close of a paper on the above subject read before the Manchester Section of the Society of Chemical Industry, Mr. R. Le Neve Foster, F.C.S., threw out the following suggestions as helping to a practical solution of the smoke question: (1) To see that the plant is constructed in such a manner as to consume the coal to the best possible advantage with a view of minimizing the emission of black smoke. (2) To fire as carefully as is consistent with the processes carried on. (3) To consider whether a number of chimneys is advantageous or not. (4) To devise some method whereby the ratio of unconsumed carbon can be readily gauged in proportion to the volume of smoke emitted and the coal used. (5) Whether the inspection of chimneys should not be in the hands of a competent Government official, who could scientifically ascertain if manufacturers were doing what was reasonably practicable.

Professor H. Adams on the Force of the Wind.—At the first meeting for the present session of the City of London College Science Society, Professor Henry Adams, M.Inst.C.E., one of the Vice-Presidents, read a paper on "The Force of the Wind.' After reviewing a number of the recorded experiments on wind pressure, he tabulated the results upon a common basis, to show that, within certain limits, the intensity of the pressure increases with the area of the receiving surface, but over large areas the maximum is not reached in practice, owing to the wind moving in concentrated gusts. An account was given of the pressure said to have been reached in various historical gales, as well as extracts from several standard works as to the proper pressure to be estimated for in designing structures. In conclusion, the author suggested that, though 56 lbs. per square foot might be looked upon as the standard, this should be modified according to the circumstances of the case—viz., with the height from the ground-level, the unsupported width, and the angle of incidence. The pressure, according to the table submitted, varied from 16 lbs. at the ground-level to 80 lbs. at the height of 200 feet, and in the latter case from 80 lbs. at a width of 10 feet to 40 lbs. at a width of 1000 feet; while the multiplier for angle varied from 0·45 at 5 degrees to 1 at 60 to 90 degrees.

REGISTER OF PATENTS.

Producing Gas by the Use of Electricity.—Dunn, J. H., of Holloway. No. 19,423; Oct. 12, 1894.

The object of this invention is "the production, by the use of electricity, of gas from coal or other fuel—such, for example, as petroleum, or other liquid hydrocarbon or other carbonaceous matter—in a rapid and efficient manner."

The inventor provides the chamber or retort in which the gas is to be generated with electric conductors, arranged in pairs after the manner of the carbons of an electric arc lamp; the several pairs of carbons, when using more than one pair, being either worked in series or in parallel as desired. The carbons are carried in tubes inserted in holes provided in opposite sides of the chamber or retort; the inner ends of the carbons of each pair preferably meeting, so as to form the arc, about midway between the opposite sides of the retort. The liquid hydrocarbon or carbonaceous matter to be gasified is introduced into the retort through suitable passages, and is caused to cover the carbon conductors; and the retort being closed, and the current of electricity turned on, the arcs struck between the pairs of carbons causes a high temperature to be produced, which rapidly generates gas from the contents of the retort; the gas produced passing from the retort, and being subjected (if required) to any suitable purifying processes.

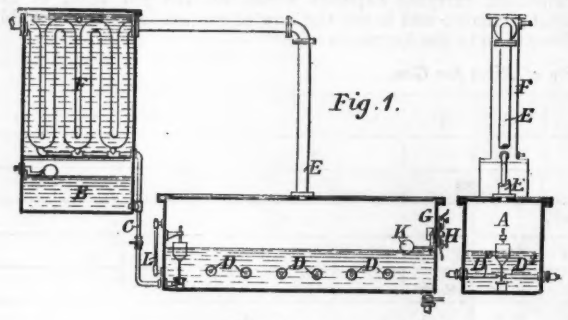


Fig. 1.

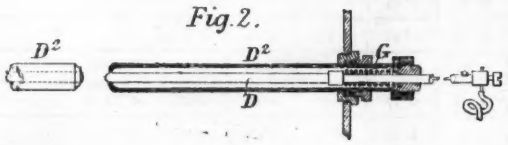


Fig. 2.

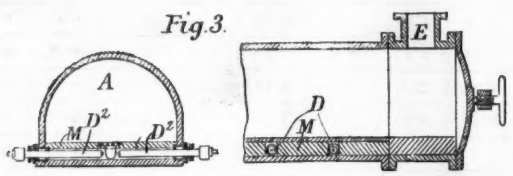


Fig. 3.

Fig. 1 represents in longitudinal and transverse section an arrangement for producing gas from liquid hydrocarbon by means of electricity. Fig. 2 is a longitudinal section of one of the carbon holders drawn to a larger scale. Fig. 3 is a longitudinal and transverse section of a portion of a retort for producing gas from coal or other solid carbonaceous matter by means of electricity.

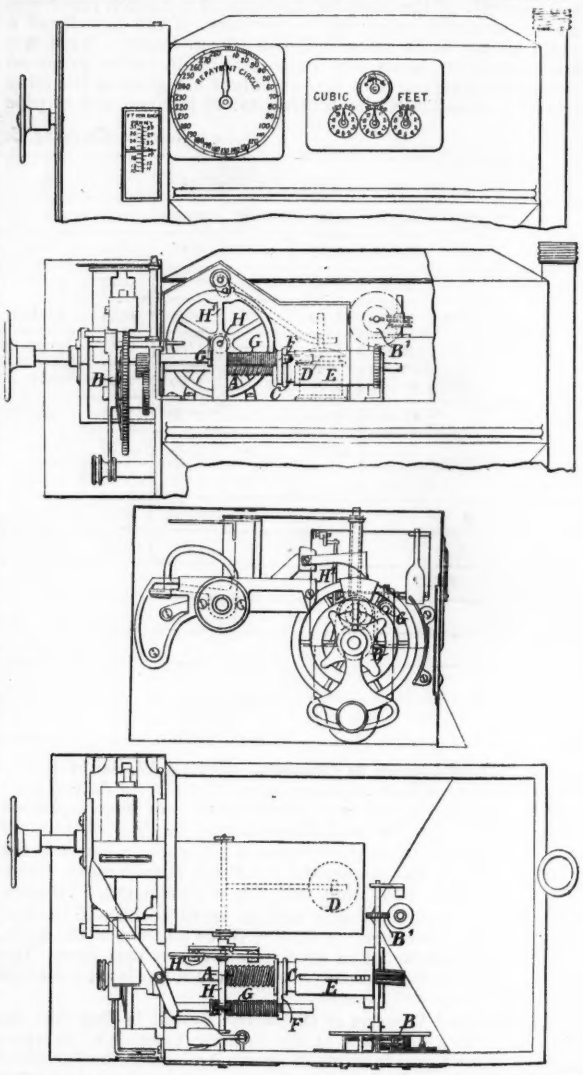
Referring to figs. 1 and 2, A is a chamber or retort for oil to be supplied from a tank B through a pipe C, provided with a stop-cock. The lower end of the pipe communicates with a chamber provided with a valve, through which the oil must pass to enter the chamber. The valve is connected to a float to automatically maintain the level of the oil uniform. The two opposite sides of the retort are provided with holes, to receive carbon electric conductors D arranged in pairs (similar to the carbons of arc electric lamps), the holders of which consist of tubes D^2, in which the carbons are free to slide under the action of springs, as shown in fig. 2, to maintain the arc. The ends of each pair of carbons may be normally in contact, or placed at such a distance apart as to prevent the arc being formed; and when the current is switched on, the tubes D^2 slide in their holes, so as to bring the ends of the carbons into position to strike the arc. As the carbons wear away, they are pressed forward in their holders by the springs, so as to maintain the arc; stops being provided to prevent the carbons from being forced too far through the tube. The oil in the chamber entirely covers the carbons; so that, when the arcs are struck, the heat therefrom rapidly gasifies the oil, and the gas generated escapes through the pipe E to a gasholder direct. It may, however, be first passed through a condenser F, wherein any ungasified vapour that may escape with the gas becomes condensed, and passes into the supply-pipe C, and is again conducted into the retort.

G is a safety device, for breaking the electric circuit should the level of the oil in the retort from any cause sink below a predetermined point. This device consists of a weighted lever H, connected to a piece in the electric circuit; the weighted lever being supported, when the level of the oil is at the required height, by means of a float K carried on one arm of a bell-crank lever, the other arm of which engages a projection on the weighted lever. Should the level of the oil sink below the normal, the float K will sink with it, and remove the arm of the bell-crank out of engagement with the projection on the weighted lever, whereupon the lever will suddenly turn with the piece on its fulcrum, and so break the circuit. The spindle carrying the piece and weighted lever H passes to the exterior of the retort A, and may be provided with a handle for returning the parts to their normal position, when the proper level of the oil is restored. L is a gauge, to show the level of the oil in the chamber or retort A.

For producing gas from coal or other solid carbonaceous material by means of electricity, an ordinary Ω or other retort may be employed, as shown in fig. 3; the carbons D for striking the arcs being fitted in holes in the sides of the retort, and operated to strike the arc by mechanism similar to that employed in electric arc lamps. The retort A is preferably provided with a false bottom M, having grooves or recesses to receive the carbons, so that they may be protected from injury when the coke is being drawn. Perforations are made in the false bottom where the arcs are formed, through which the heat passes to the coal placed upon the false bottom. The gas produced escapes in the ordinary manner by the ascension-pipe E.

Prepayment Gas-Meters.—Cowan, W. and W. H., of Edinburgh. No. 21,108; Nov. 3, 1894.

This invention relates to prepayment gas-meters of the type described in patents No. 11,537 of 1890, No. 24,490 of 1893, and No. 7988 of 1894. It consists of an arrangement of mechanism, by the use of which a predetermined quantity of gas will be placed at the disposal of the consumer every time a coin or token is placed in the money-slot of the meter, and an external handle or knob is actuated.



The patentees employ an externally screwed tube or rod A, one end of which is geared with the working parts of the prepayment mechanism B, so as to be revolved by it on the insertion of a coin. This tube or rod is carried in suitable journals, so as to prevent it moving lengthwise; and it has mounted on (and concentric to) it an internally screwed tube C, capable of being moved to-and-fro lengthwise, so as to be capable of actuating the supplementary valve D, or, it may be, the stop of the meter. The tube C is mounted within an outer tube or casing E, to which it is connected by a groove and feather or key or slotted opening and pin—that is to say, the movable tube C has attached to its periphery a projection, feather, key, or pin, which works in a groove or slotted opening formed in the outer tube or casing E in such a manner as to enable the latter tube, on being revolved by the meter mechanism B^1, to actuate the valve D or stop, in a reverse direction to that in which the inner tube or rod C actuates the valve D or stop, by means of the screwed movable tube or rod C, through the medium of the meter's mechanism revolving the outer tube or casing E. Or, if desired, the meter's mechanism may be caused during the consumption of gas to actuate the tube or rod A, and the working of the coin communicating part of the meter's mechanism to actuate the outer tube or casing E.

When the movable tube or rod C is employed to actuate a valve D, the connection between the movable tube or rod and the valve D may be effected by any suitable means, such as by one or more suitably

shaped levers; and the valve preferably used is a slide-valve of the kind described in patent No. 7988, of 1894.

As shown, a circular drop-valve D is employed, mounted within a valve box or chamber, the valve D being actuated through the medium of a projecting arm or lever F, the one end of which works in a groove or recess in the movable tube or rod C. The other end of the lever F engages with the one end of an auxiliary screwed rod or rack G, which gears into a spur-pinion, keyed on the prepayment circle or dial-shaft H, which has the valve-operating wheel H^1 mounted on it. This wheel actuates the crank of the valve's cross-shaft by means of a notch and projection, as described in the earlier patent.

Preventing the Freezing of Telescopic Gasholder Cups.—Livesey, F., of Old Kent Road, and Sugg, W., of Westminster. No. 23,826; Dec. 7, 1894.

The patentees propose to apply a series of water-heating apparatus to each lift of a holder below the top one, by the use of which the seal-water will be kept at such a temperature that it will not freeze. For this purpose, small vertical boilers are employed, closed in at the top, and having tubes by which the products of combustion can pass away. These boilers are heated by gas-jets supplied from the holder, and are provided with circulating-pipes, which dip into, and extend for some distance along, the gutter—preferably near the surface of the seal-water. The boiler is enclosed within a case fixed to the lift, and carrying at its upper part a small reservoir arranged to be automatically filled by rain water or by hand when necessary. It is connected with the circulation-pipe in the annular gutter, so that the boiler and tubes are kept full of water. The boiler is also provided with a steam-pipe delivering into the reservoir, and is surmounted with a suction and down-draught-preventing cowl. A series of these heating appliances are placed round each lift; and the gas, when lighted, heats the water in the boiler and pipes, circulation being set up, and thus the temperature of the seal-water surrounding the pipes in the annular gutters is maintained above freezing-point.

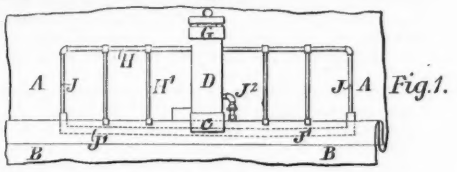


Fig. 1.

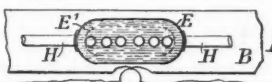


Fig. 3.

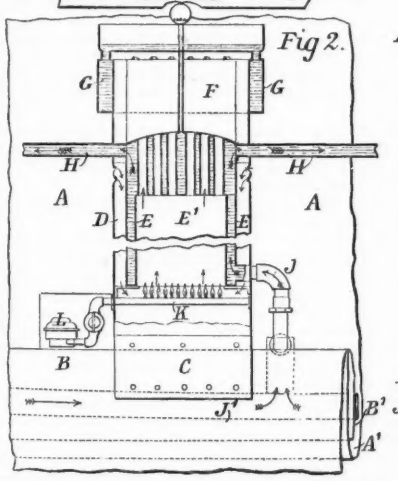


Fig 2.

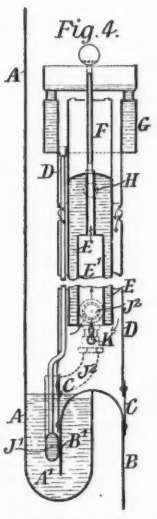


Fig. 4.

Fig. 1 is a side view of a portion of a telescopic holder, with this invention applied thereto. Fig. 2 is a vertical section of the apparatus. Fig. 3 is a horizontal section. Fig. 4 is a cross section. A represents one (the upper) lift of a holder, and B another (or lower) lift. A^1 is an annular gutter, which is filled with water, and receives the downwardly extending annular flange B^1—the two parts A^1 B^1, with the water, forming the seal. Secured to the lift B, on both sides of the bend of the flange B^1, is the casing D of the boiler E. This casing straddles the bend, and is secured in place by plates C, riveted to the lift and to the boiler-casing D. The boiler E is preferably of oval shape, and rests on brackets secured to the walls of the casing in any convenient manner. The space E^1 serves as a combustion chamber; and the products of combustion travel therefrom, by tubes (which pass through the boiler), to an upper chamber F, from which they pass to the air through the openings shown. Above the openings is a tray to catch rain water, or to receive water by which a tank or reservoir G, carried outside the casing D, is refilled; suitable connections between the tank and reservoir being provided. The chamber F, and the holes and tray constitute a suction and down-draught-preventing cowl, the construction and operation of which is well known.

H are outflow-pipes connected with the upper part of the boiler. They are connected by the bent pipes J with the heating-pipe J^1, which, in turn, is connected with the bottom of the boiler by the inflow-pipe J^2. Thus, a complete circulation of the hot water is provided for. The pipes H and J^1 extend for some distance around the holder—the former being supported by stays H^1; the latter being under the surface of the seal-water, which is thereby heated. A pipe connects the reservoir G with the pipe J^1, for keeping the boiler and circulating-pipes full of water. K is the gas-burner (of any convenient form), which draws its supply of gas direct from the holder, being tapped into the bend of the lift B—a governor L being provided to regulate the flow of gas. Air to support combustion enters the casing D by the holes shown.

Mantles for Incandescent Lamps.—Crocker, S. H., of Holborn. No. 15,246; Aug. 13, 1895.

The patentee claims as covered by his invention: 1. In the manufacture of incandescent mantles for lamps, applying the compound in a layer upon a suitable support, and perforating it upon and together with its support. 2. In the manufacture of the incandescent mantles for lamps, applying the compound in the form of a layer upon a non-absorbent support, and subsequently perforating it. 3. An incandescent mantle for lamps having corrugations from its upper to its lower edge. 4. A corrugated incandescent mantle, having its corrugations deeper or more pronounced towards its upper edge than towards its lower edge. 5. The manufacture of incandescent mantles for lamps by coating a suitable support with a compound described, and then perforating, corrugating, and baking it. The solution referred to—"to yield on ignition the luminous matter of the mantle"—is one containing a salt of erbium, which (on ignition) will become decomposed, and leave behind oxide of erbium. If the compound is applied to both sides of the mantle, the two layers will, after ignition, remain adhering together—thus giving a somewhat thicker, but rather more porous, product.

APPLICATIONS FOR LETTERS PATENT.

19,704.—Salter, G., "Coin-freed water-delivery apparatus." Oct. 21.
19,719.—Maclean, A. H., "Gas-heated smoothing-irons." Oct. 21.
19,724.—M'Lellan, N., "Reversing gas-valves." Oct. 21.
19,771.—Bayley, J. C., "Generating and regulating the consumption of acetylene gas." Oct. 21.
19,779.—Exley, J. H., "Generating acetylene gas." Oct. 22.
19,830.—Devis, A., "Production or generation of gas for artificial lighting and motive power purposes." Oct. 22.
19,916.—Ewing, W., and Meikle, J., "Enriching illuminating gas." Oct. 23.
19,922.—Hawkins, T., "Production of explosive and other gases for motive power and illuminating purposes, and carburetting such gases." Oct. 23.
19,925.—Norton, C. G., "Automatic cut-off for atmospheric gas-burners and electrical heating-stoves." Oct. 23.
19,948.—Thorn, F. S., and Hoddle, C., "Incandescent gas apparatus for photographic purposes." Oct. 23.
19,951.—Roberts, H. T., "Self-igniter for gas-engines." Oct. 23.
19,952.—M'Donald, G., "Filtering water, sewage, effluents, illuminating gas, and other liquids and fluids." Oct. 23.
19,982.—Thomas, T. C. J., "Gas-lamps." Oct. 23.
19,987.—Kelly, T. J., "Intensifying method for increasing the illuminating power of lamps." Oct. 24.
19,998.—Westmorland, J., "Fittings used in the lighting of billiard-tables by means of gas." Oct. 24.
20,018.—Hawkyard, J., and Braddock, J., "Prepayment gas-meters." Oct. 24.
20,072.—Luis, C. G., "Producing acetylene gas." Oct. 24.
20,117.—Young, T., and Guthrie, J., "Preventing vibration in incandescent gas lights, lamps, and the like." Oct. 25.
20,152.—King, R. M., "Gas-supply tubes for gas fires and stoves." Oct. 25.
20,188.—Thomas, O., and Dyer, J. H., "Pipe-joints for water-taps and the like." Oct. 26.
20,208.—Tollerton, J., "Gas-lamps for theatres, public buildings, and the like." Oct. 26.
20,225.—Videau, G. L., "Furnace for use in the manufacture of gas and for other purposes." Oct. 26.
20,259.—Potter, G., "Descending Bunsen burners for incandescent mantles." Oct. 28.
20,260.—Leveritt, T. D. C., "Gas heating-stove." Oct. 28.
20,283.—Chambard, B., "Supporting the mantles of incandescence gas-burners." Oct. 28.
20,305.—Kane, T., "Gas and like engines, and mixing and volatilizing the gases in the same." Oct. 28.
20,382.—Potter, G., "Ascending Bunsen burners for incandescent mantles." Oct. 29.
20,394.—Nicholson, E. W., "Automatically lighting coal or other gas." Oct. 29.
20,430.—Clouard, A., "Gas-producer." Oct. 29.
20,451.—Hinks, J., and Son, Ltd., and Hinks, H., "Raising, lowering, and suspending lamps or other illuminating lights." Oct. 30.
20,453.—Exley, J. H., "Generating acetylene gas." Oct. 30.
20,454.—Potter, G., "Regenerating and superheating Bunsen burners for incandescent lighting." Oct. 30.
20,468.—Atkinson, J. E., "Manufacture of acetylene gas." Oct. 30.
20,496.—Irwin, W., "Carburetting or enriching gas." Oct. 30.
20,570.—Tollerton, J., "Gas-lamps." Oct. 31.
20,583.—Thompson, W. P., "Burners for gas-cookers, gas-stoves, and other like heating apparatus." A communication from C. Wolff and A. Behl. Oct. 31.
20,588.—Knapp, C., "Gas-burners." Oct. 31.
20,613.—Butler, E. S., "Globe and chimney supports for gas and other burners." Oct. 31.
20,632.—Bancroft, W. S., and Priestley, G. F., "Manufacture of retorts and other goods from clay or like material." Nov. 1.
20,667.—Notkin, N., "Automatically and continuously carburetting air for illuminating and heating." Nov. 1.
20,697.—Brouwer, J. de, "A new Bunsen blowpipe, or Bunsen lamp—namely, an appliance for burning a mixture of air and gas or inflammable vapour for the production of intense incandescence of mineral substances employed for incandescent gas-lamps known by the name of 'Auer' or 'Von Welsbach' lamps, or other analogous lamps." Nov. 1.
20,703.—Lister, F., "Gas and like motor engines." Nov. 2.
20,705.—Bickerton, H. N., "Gas-engines." Nov. 2.
20,727.—Exley, J. H., "Generating acetylene gas." Nov. 2.
20,752.—Saatmann, F. W., "Manufacture of ammonia." Nov. 2.
20,766.—Dawson, H. T., "Inertia governors for gas and other engines." Nov. 2.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Defects of Water Meterage Systems.

SIR,—Referring to the paragraph in your issue for Oct. 29, p. 868 (headed as above), I am not at all surprised to find that the meters referred to "seldom register against the consumer;" nor is it to be wondered at that "in some metered distribution systems, about twice as much water is pumped as the total registration accounts for." The explanation is simple. The meters, which are almost universally employed in America, are of a type which are not "tight." They will therefore not register occasional small flows; and they will further become more and more leaky as wear takes place. Also, when obstructed by impurities, they will frequently stop entirely, but will allow water to pass without being registered. The statement about meters not being allowed to be fixed "if showing errors of more than 1 per cent.," is misleading and valueless, unless accompanied by data giving rates of flow in (say) gallons per hour during the said accuracy tests. These types of meters—in common with the "inferential" type—will register fairly accurately at quick flows, and when clean; but they will not do so at small rates of flow, as when water runs through a ball-valve into a cistern, nor when the meter or its counter becomes obstructed by dirt. I have been informed that, in a certain town in the States, the $\frac{5}{8}$-inch meters, when tested after a certain length of service, are not tried below 24 gallons per hour; and the $\frac{3}{4}$-inch ones, not below 145 gallons per hour. The reason is obvious. Some of the 50 per cent. discrepancy mentioned in the paragraph is, no doubt, due to leaky mains and services; but the meters are probably the greatest culprits.

M. R.

Nov. 4, 1895.

Keeping up the Gas Supply without a Gasholder.

SIR,—I shall be glad if any of your readers who may have had experience in the above, would, through the medium of the JOURNAL favour me with their opinions as to the feasibility of carrying out the following object under the circumstances stated below.

I have a small holder which is now too small; and, owing to special and surrounding circumstances, it is almost imperative that a new telescopic holder in the present tank should replace the existing one. It would take three weeks to erect; and, if done in June, this would mean only 3000 cubic feet of gas per night being supplied. With a setting of five retorts, and arranging the charging so as to keep up a constant supply, I think this might be done. A little extra expense in working, or waste of gas, or preparation, would be of little consideration against attaining the main object. I should, however, prefer having the assurance that a similar feat has been accomplished, or that it is practicable, although not very desirable.

STORAGE.

Nov. 4, 1895.

The Affairs of the Para Gas Company.

SIR,—The Pará Gas Company's Directors are proposing to reconstruct the Company, and give the preference shareholders a priority of capital in case of winding up, which priority is not attached to the preference shares now. This is a monstrous injustice to the ordinary shareholders, and may wipe out (in case of liquidation) their capital altogether. Only one of the Directors holds more than the necessary qualification. There is to be a meeting on the 26th inst., to consider the proposal. I hope all shareholders will attend, and look after what remains of their capital; or it will soon be less than it is in value, and it is nearly at zero to-day.

S. JOSHUA COOPER,
Holder of 600 ordinary shares.

Mount Vernon, near Barnsley,
Nov. 9, 1895.

The Proposed Adoption of Incandescent Gas Lighting at Fulham.—It may be remembered that the Fulham Vestry recently decided, but only by the casting vote of the Chairman, to have a trial of incandescent gas-lights in some of the public lamps. The resolution has since been rescinded.

Incandescent Gas Lighting at Winchester.—The streets of Winchester are gradually emerging from the twilight of the oil-lamp system into the brilliant illumination of the incandescent gas-light. Three or four of the principal streets are already lighted with the new burners; and the whole of the lamps will soon be connected with the mains, and the lanterns refitted. The improved lighting is giving general satisfaction.

The Charge for Gas in the Salford Out-Districts.—The Gas Committee of the Salford Corporation recently received a deputation from the Worsley Urban Council with respect to the differential rate charged to consumers of gas in the Walkden and Little Hulton districts, which are situated at the extreme limit of the Corporation's area of supply. The price charged by the Committee in the Eccles and some portions of the Worsley district is 2s. 6d. per 1000 cubic feet; but at Walkden and Little Hulton, the figure is 2s. 11d. The Committee admitted that the differential rate of 5d. was too large; and they decided to recommend to the next meeting of the Council a reduction of 2d. per 1000 cubic feet.

New Joint-Stock Companies.—The following new Companies have lately been registered: The Meteor Incandescent Lighting Company, Limited, with a capital of £140,000, in £1 shares, to manufacture and deal in incandescent lights and carry on business as gas engineers, &c. The Truro Gas Company, Limited, with a capital of £25,000, in £1 shares, to enter into an agreement with the Truro Gas Company and the Liquidators thereof, and generally to produce and supply light in the city of Truro and elsewhere. The West African Oil Syndicate, Limited, with a capital of £40,000, in £1 shares, to enter into agreements for the acquisition of certain lands in the Gold Coast Colony, to develop and turn them to account, and to carry on business as importers of, and dealers in, coal tar, petroleum, &c.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.
Saturday, Nov. 9.

(*Before the* LORD CHIEF JUSTICE *and Mr. Justice* GRANTHAM.)

Price v. The South Metropolitan Gas Company—The Southwark Bridge Explosion.

This case came before the Court on an appeal by the defendants from the decision of the Judge of the Lambeth County Court, given in June last, awarding the plaintiff £12 by way of damages, arising out of the Southwark Bridge explosion. (See JOURNAL, Vol. LXV., p. 1385.)

Sir E. CLARKE, Q.C., M.P., and Mr. ATHERLY JONES appeared for the appellants; Mr. LYNDEN BELL represented Price.

Sir E. CLARKE, in opening the case, said the action was brought by a labourer named Price, who, when going across Southwark Bridge in February last, was blown into the air by an explosion which occurred under the roadway. It was alleged that it was caused by an escape of gas from a cracked pipe belonging to the defendant Company. According to the evidence, it appeared that, about a month prior to the accident, the ground in the vicinity of the pipe in question had been opened by Messrs. Mowlem; and it was no doubt owing to the disturbance of the soil by them that the pipe became cracked. The judge found that the defendants had been guilty of negligence in not having such a system that they could find out when the ground was opened under their pipes, and in not discovering the escape. He also found that it was negligence on the part of the defendants in not having seen to the replacement of the earth under the pipe after the ground had been opened. If this finding were to stand, it would impose upon the Company, with 800 miles of pipes, the duty, at the risk of being held negligent, of finding out every time sewer authorities, electric light people, or anyone else opened the ground.

The LORD CHIEF JUSTICE remarked that this did not seem to be a very formidable obligation, because the lamp-lighters were constantly going up and down the streets, and so had the opportunity of seeing what was going on. According to Mr. Livesey's evidence, it was the duty of the employees of the Company to report when the ground was opened.

Sir E. CLARKE said frequently the ground was opened and closed again in two or three hours, before any information could be conveyed to the Company's offices. If the Company had had notice of this opening by Messrs. Mowlem, and if they had had an opportunity of sending an inspector to see that they did not, in the course of their work, affect the stability of the pipe, a different argument would arise. Then it might have been said that, knowing of the opening of the ground, and not guarding against injury to their pipe, the Company were negligent. But in the present case, as the Company were not informed of what had taken place, he contended that they were not negligent. The mere fact of an escape of gas at a particular spot was not, in itself, evidence of negligence. It might arise from all sorts of causes which were not preventible. Again, a mere escape of gas would not, by itself, bring about an explosion. There must be something to cause it to explode.

The LORD CHIEF JUSTICE asked if there was any provision that people who opened the ground should give notice, to gas companies and others owning pipes under the soil, of what they were doing.

Sir E. CLARKE said there was not.

The LORD CHIEF JUSTICE: You do not object to the amount of the damages, supposing you are liable?

Sir E. CLARKE said he did not. He then referred to the Gas-Works Clauses Act, 1847; section 24 being the one referring to the liability of a gas company in respect of an escape. The words of the section were as follows: "Whenever any gas shall escape from any pipe laid down or set up by or belonging to the undertakers, they shall, immediately after receiving notice thereof in writing, prevent such gas from escaping; and in case the undertakers shall not, within 24 hours next after service of such notice, prevent the gas from escaping, and wholly remove the cause of complaint, they shall for every such offence forfeit £5 for each day during which the gas shall be suffered to escape." This section referred to the escape of gas in the houses which the undertakers served; and it was the only penalty imposed on the gas company in respect to an escape. He submitted that no sufficient evidence of negligence had been proved against the defendants to render them liable.

The LORD CHIEF JUSTICE, without calling upon the respondent, in delivering judgment, said the plaintiff in this case sued the South Metropolitan Gas Company for negligence, which he alleged caused him damage. The case came before the County Court Judge at Lambeth, who found that there was negligence causing the plaintiff damage; and accordingly he gave judgment for him. The question before the Court was whether that judgment could be supported. Sir E. Clarke was quite right in his contention that, before the plaintiff was entitled to succeed, he must establish negligence of an actionable kind. It was clear that the Company, having statutory powers and authority to lay their pipes, were not liable in respect of anything which might happen to anybody in the exercise of that statutory power, unless they were guilty of negligence—in other words, the "wild beast" principle, as it had been called in a well-known case, did not apply to this case. The facts were that in the month of January last Messrs. Mowlem and Burt, the Contractors for the Commissioners of Sewers, did some work in the neighbourhood of the gas-pipe. The details of the work, and the precise way in which it affected the gas-pipe, were not stated. The pipe in question was a 3-inch main, and was embedded in the soil of the public highway at a depth of 10 inches from the surface. On the 1st of February, the plaintiff, lawfully passing along the highway, received damage from an explosion of gas which took place in close proximity to the spot at which Messrs. Mowlem had been at work the previous month. Thereupon he brought his action, and established certain facts, from which he said an inference of negligence against the Company might properly be drawn. There was found to have been an old longitudinal crack in the pipe in question, which the plaintiff said rendered it an improper pipe. But the existence of this fact was not known, nor did there seem any ground for saying that it was not known

in consequence of any negligence of the defendants or their employees. This crack was not the immediate cause of the accident; but it had been said by Mr. Livesey that its existence would have the effect of rendering the pipe weaker at that point. Then there was found to be, at right angles to the longitudinal crack, a crack of some two or three days' standing at the time of the accident. There was no doubt that it was from this transverse crack that the gas escaped which caused the accident. Further, it was shown that, in the immediate neighbourhood of this transverse crack, the soil had been disturbed to a distance of some 2 ft. 5 in.; and one of the servants of the Company, referring to the looseness of the soil, spoke of putting his crossbar in easily to a depth of 18 inches. This pointed to the fact that this gas-main was not adequately supported by the soil underneath, and, therefore, was more liable to receive damage, not merely from the influence of the frost, which was severe at that time, but from the action of the heavy traffic which passed over the highway in question. It was said that, as regarded the loose state of the soil, no blame or negligence should be attributed to the Company, because they did not know that the ground had been disturbed. He (his Lordship) would here take the opportunity of saying that it did seem to point to a serious omission in the provisions of the Local Acts that the parties who, under statutory authority, interfered with the surface of the Queen's highway, in, under, and along which pipes of various kinds for water or gas, tubes containing electric wires, &c., were laid, were not compelled to give to all other persons who had like rights, notice of their intention to disturb the surface. However, it seemed, according to the statement of the defendants' Counsel, that there was no such provision. Would it be imposing on the Company, who, it was known, had practically the monopoly of the supply of gas in the South Metropolitan district, a very onerous obligation that they should be required, by their servants, to be vigilant to see whether or not there was any disturbance of their pipes, which might be the cause of mischief to the public. The Company had obtained their powers no doubt originally in the public interest; but they carried on their business for their own profit. The carrying on of their business involved the employment of a number of men whose duty it was daily—one might almost say hourly—to go up and down the streets and thoroughfares along which the gas-pipes were laid. The evidence of Mr. Livesey showed that it was part of the business of the employees to report to head-quarters the fact of any of these disturbances; and rewards were given for such reports. The fact of the employees omitting to make a report was a burden which the Company must bear. They could not be exonerated, merely by saying that the employees did not report this particular thing, from exercising reasonable diligence and care. The employees might have known, ought to have known, and ought to have reported. There was one remaining point, upon which no stress had been laid; but still it was a point unquestionably that must be considered by the Company in future in the light of the experience which recent events had disclosed. He adverted to it, not for the purpose of basing his judgment upon it, but simply to show that he had not forgotten it. It seemed a strange thing that gas-mains of this importance should be, wholly apart from any question of frost or disturbance of the soil, permitted to be placed in a highway having heavy traffic, at so slight a distance below the surface as 10½ inches. In conclusion, he would say that, looking to the character of the crack, and the length of time during which the gas was in all probability escaping from it, it ought to have come to the knowledge of the employees of the Company at an earlier period than the date of the accident, and by them reported to the defendants. The Company ought to have known of the disturbance to the soil, and ought to have seen that the ground was properly restored by Messrs. Mowlem—rammed home tightly, so as to form an adequate support to the pipe. The simple point being whether there was evidence on which the County Court Judge could properly find there was negligence, speaking for himself, he had no hesitation in saying there was. The appeal must therefore be dismissed.

Justice GRANTHAM concurred.

Sir E. CLARKE said, as this was a very important case to the Company, he would ask for leave to appeal, should they be so advised.

The LORD CHIEF JUSTICE saw no objection to granting the leave; but he suggested that the defendants should pay the plaintiff his claim, and costs.

Sir E. CLARKE said his clients would be quite prepared to do this. An appeal had not yet been decided upon.

HIGH COURT OF JUSTICE, IRELAND—QUEEN'S BENCH DIVISION.—Monday, Nov. 4.

(*Before Justices* JOHNSON, O'BRIEN, *and* GIBSON.)

Alliance and Dublin Consumers' Gas Company v. Dublin Corporation.

This case came before the Court to-day for the making of a final order in reference to recent litigation between the parties, on the subject of the gas lighting of the City.

Mr. R. P. CARTON, Q.C., appeared for the Corporation; Mr. A F. BLOOD, for the Company.

Mr. CARTON said the parties had agreed to the form of the order, except as to the old question of the "bends," which amounted to the ridiculous sum of 7s. 9d., and neither side was inclined to give way. Under these circumstances, it would be an absurd thing to have a new trial on this point. The whole question was whether a bend was really part of the lamp-post, or whether it was not part of the machinery for conveying the illuminant, and therefore the Company, and not the Corporation, should bear the expense of it. The action was brought for £308 os. 2d.; and the Corporation lodged £32. After the trial, they found that they had not lodged enough; and they admitted liability for £61 11s. 11d., including the £32. The jury gave, not £308 os. 2d., but £307 18s. 2d.; there being a slight mistake in the total. On the new trial motion, there were two questions argued. One was whether the Corporation or the Company were to bear the expense of fixing the meters in the lamps; and this was decided against the Corporation. The other question was whether the Corporation were liable for payment in case of alteration in the position of lamps, or resumption of discontinued lamps; and the Court decided this against the Company. The figures worked out so that, instead of £307 18s. 2d. which the jury found, the Court held that the Company were only entitled to £147 10s. 8d., after giving credit for £61 11s. 11d.—in other words, the Corporation had won £160 19s. 6d. in the litigation; and the other side had increased the sum admitted by £85 18s.

Justice GIBSON said the Court had provided that both parties should pay their own costs of the argument, and that the defendants should bear the costs of the trial.

Mr. CARTON pointed out that Justice Holmes, in his judgment, said: "The plaintiffs are entitled to the costs of the action; but I think that under no circumstances ought they to have the costs of this argument. It appears on the matters really argued that defendants were entirely successful; and the defendants ought to get the costs. But until we know this matter about the meters, we cannot very well say finally." He would ask that judgment should be entered for £147 10s. 8d., excluding the 7s. 9d., and let it be without prejudice on that subject.

Justice O'BRIEN asked whether it was really worth while having a new trial for 7s. 9d.

Justice GIBSON said he was of opinion that, inasmuch as the Company had to supply the gas, they should also supply the bends.

Mr. BLOOD said that, if judgment was entered for £147 10s. 8d., with a memorandum that it was without prejudice to the rights of the plaintiffs on the subject of bends, he was quite satisfied.

The Court directed that a verdict should be entered for £115 10s. 8d. and the sum lodged in Court, £32—the parties agreeing to strike out the 7s. 9d. hitherto in dispute with regard to certain bends, without any prejudice to the rights of the parties irrespective of any claim thereon; both parties to abide the costs of argument, and the plaintiffs to have the costs of the trial.

A prospect of yet further litigation between the Gas Company and the Corporation has, says the *Freeman's Journal*, been opened up by a notice which has been served by the Solicitors for the Gas Company (Messrs. D. and T. Fitzgerald) on the Law Agent of the Corporation (Mr. J. M'Sheehy). This is notice of the intention of the Gas Company to apply to the Master of the Rolls for an injunction against the Corporation for disobedience of an order made by his Honour on July 6, when, in the course of his judgment on the litigation between the two bodies, he directed that certain defective meters should be removed from the public lamps of the city. It is alleged that the Corporation have not complied with this order; and the Gas Company appear to be determined to lose no time in enforcing their rights.

An Ingenious Plea for Reduced Water-Rent.

At the Hove Petty Sessions, on Monday last week, Mr. R. Speed, of High Street, Portslade, was summoned at the instance of the Shoreham and District Water Company, for the non-payment of £3 10s. for water supplied. Mr. F. T. Pearson, who appeared for the Company, said the claim was for water-rates, in respect of premises owned and occupied by the defendant; and the dispute turned upon the interpretation of the 47th section of the Company's Act, under which they were not obliged to furnish a supply to a single tenement for any less sum than 10s. in one year. The rate charged was 1s. in the pound; but in the case of tenements worth less than £10 per annum, as was the case with four cottages owned by Mr. Speed, the Act allowed the Company to charge 10s. a year if paid in advance, or 12s. if paid in arrear. The Company, however, were only asking for 10s. each for the four cottages, and 30s. for the house occupied by Mr. Speed. Mr. Cowell produced the Company's Portslade rate-book, which showed that Mr. Speed's house was rated at £30 a year, and the four cottages owned by him at £40 a year. In cross-examination, witness said that Mr. Speed had tendered 50s. in settlement; but it was refused, though this sum was equal to a rate of 1s. in the pound on what Mr. Speed said was the rent he paid as lessee of the property. Mr. J. J. Frampton, the Secretary of the Company, deposed to Mr. Speed signing the ordinary form of application for water to be supplied to the four cottages. Mr. A. Treacher (for the defence) contended that, while the Company were not bound to furnish a supply to any tenant for less than 10s. a year, they could not charge this sum, except under a special contract, if they did supply water to a tenement worth less than £10 per annum, as all the four cottages admittedly were. The consumers had no knowledge of this proviso; and Mr. Speed refused to pay as soon as the demand was made upon him. He tendered 50s., which was at the rate of 1s. in the pound on the rental. The Chairman (Mr. A. G. Henriques) remarked that people were supposed to know every Act of Parliament. Mr. Treacher pointed out that this was a Private Act. The Chairman said that was quite immaterial. Mr. Treacher did not agree to this; and pressed the argument that the Company's Act was only an enabling statute, and that it required some special contract to be entered into before the Company could take advantage of its proviso. The Chairman said the Court were unanimous in deciding that Mr. Speed had entirely failed in his contention, and that a customer was not entitled to set up the defence that he was ignorant of the Company's powers. An order was made for the payment of the amount claimed, with costs.

Liability for Gas on Common Stairs.

Sheriff Cheyne, the County Judge of Renfrewshire, has lately heard an action raised at the instance of the Barrhead Gas Company, Limited, against A. Darroch, for payment of an account amounting to £9 6s. 8½d, for gas consumed on the stairs of defender's property. The account extended over a period of about three years. The defence was: (1) That there was no contract between the pursuers and defender for the supply of the gas in question, which was consumed by the tenants of the property; that there was no obligation on a landlord to light stairs prior to the recent adoption of the Burgh Act by the ratepayers of Barrhead; and that although a landlord might be said to have an interest in lighting, it was of the same nature as the interest which he had in having the separate houses of his tenants

supplied with gas, for the consumption of which he was not liable. (2) That, in any event, in the circumstances in which the account was incurred, the defender was entitled to be relieved of liability. The defender's factor absconded at the beginning of the year; and the defender then heard of the action for the first time. The pursuers had no right to give credit to a local house-factor for three years without the knowledge of the proprietor; and the credit so given could only be construed as credit to the factor, not in his capacity as factor, but as an individual. The defender's right of relief had been cut off; and on grounds of equity, therefore, apart from any special rule of law, he should be assoilzied. Evidence was led by the pursuers, which was held to prove contract; and the second plea for the defender not being accepted, his Lordship passed decree without comment.

The New Water-Works for Plymouth.—A report has been presented to the Plymouth Borough Council by Mr. J. Mansergh, M.Inst.C.E., and Mr. E. Sandeman, Assoc.M.Inst.C.E., the Engineers for the new water-works, on the progress made in the construction of the new reservoir. They state that all the excavations in the lower part of the trench for the Burrator dam have been completed, and a foundation has now been reached which they consider satisfactory. They proposed to commence the building of the masonry dam in the week following the date of the report (Oct. 24).

The Electric Lighting Question at Bangor.—The discontent of the ratepayers of Bangor with the action of the City Council in applying for a Provisional Order to establish an electric light plant in the city, found expression last Friday at a meeting of ratepayers. Dr. Emyr O. Price presided, and justified the convening of the meeting to discuss a question of such importance as the proposed expenditure of £13,000 on electric light, equal to an expenditure of above £1 sterling per head of the inhabitants. He entered into the history of the gas-works, which were bought by the Corporation in 1878, and said the large increase in the consumption of gas resulting from a reduction in price, necessitated the provision of greater facilities for its production; and it was out of this necessity that the present crisis arose, and decided a majority of the Council to introduce the electric light. He was surprised that in this matter the ratepayers had not been consulted; and it would be for them to say whether they approved or disapproved of the action of the Council. He added that the additional expenditure of about £4000 just now necessitated in connection with the gas-works would be more than recouped by the increased consumption of gas that would follow. A resolution was passed calling upon the Council to reconsider the matter, with a view to deferring any action beyond securing the necessary powers to proceed, and that no further steps be taken without consulting the ratepayers by means of a public meeting.

The River Dee and the Chester Water Supply.—The proposed sluicing of the River Dee at the Weir at Chester has been considered at a meeting of the citizens, convened by the Mayor (Mr. Churton). As stated in a paragraph recently appearing in the JOURNAL, the provision of these services will be of considerable advantage to the Water Company by relieving their intake of the suspicion that the water drawn in there is contaminated. After the Mayor had submitted a resolution consenting to the Council promoting a Bill in the next session of Parliament, to enable them to carry out the work, the scheme was subjected to a good deal of criticism. One gentleman contended that, if the water supply was to be absolutely above suspicion, it must be taken from another source altogether; and it was also urged that, if the Water Company did their duty, they would pay for the whole of the work out of their own pockets, if it was going to be the benefit to the supply that was expected. The Engineer of the scheme (Mr. Stoney) described how similar work had proved beneficial to the water supply of Rotterdam. In winding up a long discussion, the Mayor said that, under their Act of Parliament, the Company had power to supply the city, and a right to take their water, from the present intake; and they might continue drawing it from the river unless Parliament interfered with them. After all, the Town Council were the sanitary authority of Chester; and it rested with them to remove any suspicion or doubt in reference to the water. All he could say was that, if they had to use compulsion with the Company, it would more likely cost £80,000 than £8000. He had never said that the present water was impure; but the possibilities of the case had to be considered. The resolution was passed by a large majority.

Sales of Shares.—On Monday last week, 40 shares in the *Bideford Gas Company*, of the nominal value of £10 each, and bearing 7 per cent. interest, were sold by Messrs. Dymond, Son, and Blackmore, at from £15 10s. to £15 15s. per share.——At a recent sale in Norwich, 305 ordinary £10 shares in the *Norwich Water Company*, bearing a dividend of 6 per cent., were knocked down at an average price of £18 10s. 6d. each. On the same occasion, 12 £10 new preferential "A" shares in the *Great Yarmouth Water Company*, with a dividend of 6 per cent., realized an average of £18 12s. 6d. each; and 30 £10 preference "B" shares in the same Company, bearing 5 per cent., reached an average of £16 each. A few 5 per cent. second preference shares (£6) in the *Lowestoft Water and Gas Company* secured £11 each.——The £2500 of new ordinary stock in the *Lewes Gas Company*, authorized to be raised under the provisions of the Company's Act of 1878, have been offered for public competition, in lots of £100 each; the prices realized per share averaging £155.——A new issue of 397 "C" shares (£10) in the *East Grinstead Gas and Water Company*, bearing 7 per cent. dividend, has been submitted to public competition; the prices realized being £10 15s., £10 17s. 6d., and £11 per share. A number of the shares were not sold.——There was keen competition at Eastbourne, on Monday last week, for shares in the *Eastbourne Gas Company*, which were offered for sale by Mr. J. C. Towner. Original £10 shares fetched £30 and £30 2s. 6d. each; and some "B" shares realized £23 and £23 5s. apiece.——Last Thursday, four £10 shares in the *Maidstone Water Company* were sold by auction at £27 each, and five similar shares at £26 15s. each.——At Kirriemuir, last Friday, 28 £5 shares of the *Kirriemuir Gas Company* were sold by auction, and realized the following prices: Ten, £5 5s. each; ten, £5 7s. 6d. each; and eight, £5 10s. each.

MISCELLANEOUS NEWS.

THE EXTENSION OF THE CROYDON GAS-WORKS.

Opening of a New Gasholder.

As many of our readers are aware, the execution of a large scheme of extension has been in progress, during the past three years, at the Croydon Gas Company's works. A description of one section of the scheme appeared in a previous volume of the JOURNAL;* and now we have to record the successful completion of a holder which is a splendid, and (it is not too much to say) a model piece of engineering work of its kind. This important addition to the works entered upon active service last Friday, when, in the presence of his colleagues, a number of prominent gas engineers, and other visitors, the Chairman of the Company (Mr. Charles Hussey) opened the outlet-valve, and allowed the gas to pass into the mains leading into the district.

The holder is situated on a piece of land separated from the manufacturing portion of the works by the main line of the London, Brighton, and South Coast Railway, under which line two subways have been constructed—one for the mains leading to and from the holder, and the other for foot traffic. The designer of the new holder is the Company's Engineer (Mr. J. W. Helps, Assoc.M.Inst.C.E.), upon whom last Friday expressions of praise were freely bestowed by the several competent judges of such work who were present. Contrasted with the old holders on the works, the new structure is light in appearance. It consists of three lifts, and is surrounded by 22 standards. The inner lift is 187 feet in diameter by 37 feet deep; the middle lift, 190 feet diameter by 36 ft. 9 in. deep; and the outer lift, 193 feet diameter by 36 ft. 6 in. deep. The total height of the holder at the centre when full of gas is 118 ft. 7 in., with a rise of 12 ft. 6 in. in the crown. The whole of the work, with the exception of the bases and finials (which are of cast iron), is of English steel; and the total weight of the material is about 960 tons—the floating weight being 525 tons. The capacity is 3 million cubic feet. The dimensions of the tank, which is constructed of brick and puddle, is 195 feet by 36 ft. 6 in. from the top of the coping to the resting-blocks. Messrs. John Aird and Sons were the contractors for the tank; and Messrs. C. & W. Walker, for the holder.

In passing to the new holder, the Company stopped to inspect the new retort-house, after which they assembled, under an awning, by the valves controlling the holder.

Mr. HELPS, by request of the Directors, asked the Chairman to perform the ceremony of opening the gasholder, or, in other words, to open the outlet-valve, to pass the gas into the distribution mains. He had also, on behalf of the Directors, to ask Mr. Hussey to accept from them a key, with which to unlock the valve; and this he had much pleasure in handing to him. [The key is a silver one, cased with gold, and suitably inscribed.]

The CHAIRMAN, having mentioned that it somewhat surprised him to receive such a handsome key from the Directors, unlocked the valve, and, having turned it, he declared it was open for the first time to admit gas into the mains of the town. Proceeding, he said that the contract for the tank was entered into with Messrs. John Aird and Sons, in 1894; and it was begun in March, and finished at the end of that year. The construction of the holder was commenced by Messrs. C. & W. Walker in the spring of this year; and they had already successfully finished it. Instead of erecting a holder of two million cubic feet capacity, which would have answered their requirements for a year or two, the Directors determined to take advantage of the low price of iron, and construct one of three millions capacity.

The party then proceeded to the workmen's recreation-room, where luncheon was served; and subsequently several toasts were proposed. The usual loyal toast and "The Corporation of Croydon" were first honoured, and then

The MAYOR (Alderman F. T. Edridge) proposed "The Chairman and Directors of the Croydon Gas Company." He referred to the contemplated introduction by the Corporation of the electric light, and remarked that the extensions of the gas-works showed it was perfectly clear that the Directors did not anticipate, in the near future at any rate, any diminution in their business.

The CHAIRMAN, in responding, mentioned that he had received a telegram from Mr. C. C. Carpenter, the President of the Institution of Gas Engineers (who had been expected to reply to one of the toasts), announcing his inability to be present, but fortunately they had a gentleman, in the person of Mr. H. E. Jones, who was well known in the gas profession, to take his place. Having thanked the Mayor for the kind expressions he had used in regard to the Company, the Chairman said he was delighted to see present the gentleman who might be regarded as the father of their Company. He referred to Mr. W. Hyslop. That gentleman and a few others in Croydon banded themselves together a number of years ago to see if they could not produce a better state of things in connection with the gas supply than then existed—the price of gas being at that time 16s. per 1000 cubic feet. They entered into negotiations with Mr. Overton (who introduced gas into Croydon) for the acquisition of his works; and they were successful. But soon after commencing operations, the new proprietors found that they had competitors in the field, who had actually commenced the construction of new works. They approached their opponents with the object of buying them out. Their terms were exorbitant; but ultimately their concern was purchased for £1000. In 1847, the Company obtained an Act. It was interesting to notice that in that year the wages amounted to £368 19s. 7d.; in 1855, they were about £4 a week; while in the past year, they had amounted to £16,000. In the matter of public lighting, they were always supported by the old Local Board. In 1860, they had in use 342 street-lamps; while at the present time, the lamps numbered 1920. In 1847, the sum of £10,637 was spent upon capital account. He had no doubt this included a part of the purchase-money paid to Mr. Overton, and probably the cost of a holder erected about that time at Pitlake. In 1866 the works were removed to Waddon; and, from then to now, they had gradually enlarged them. During the five years he had been a Director,

* See Vol. LXII., p. 1045.

they had spent, and contemplated spending, no less a sum than £80,000 in improving the works. It was no use attempting to rest with their Engineer, who was a man who thirsted for work, and was ready to grasp every new idea that would improve the production of gas.

Mr. CORBET WOODALL said this was admittedly a notable day in the history of the Company. They had brought into use a structure which was of considerable interest from an engineering point of view, and was a great credit to its designer, and to those who had carried out its erection. The Mayor had stated that the Corporation were in the future to be friendly critics and rivals of the Gas Company in the field of lighting. For his (the speaker's) own part, he thought it was to be regretted that there should be two sets of individuals charged with the responsibilities of lighting a town like Croydon. The development of gas lighting during the past 40 years had been wonderful indeed, and up to the present the growth of the industry had been on an increasing ratio; and it promised to continue so. In the early days of the industry, it was blessed by having men at its head of high character and distinguished attainments. They were, however, few in number; and it might be said that the industry had had to struggle along during the last fifty years with comparatively untrained men. This might perhaps be said of most industries in this country—that the technical training of those who had the guidance of them had been remarkably poor. But in regard to the gas industry this had been mended in recent times; and they had now men who were worthy of so great a charge. He had great pleasure in proposing the health of the Company's Engineer. Among the young men who had risen up to take a distinguished position in the industry, there were few who held a more honoured place than Mr. Helps. They had seen that day something of his works; and the works spoke for him.

Mr. HELPS, in reply, expressed his sincere pleasure at hearing the words which had fallen from Mr. Woodall. Referring to the new holder, he said that it would enable them to store 1½ times more gas than they had been able to do in the past. Why, he asked, did they go to such a large extent in increasing the storage? In days gone by, it seemed always sufficient for a gas engineer to simply consider the hours of light and darkness in any 24 hours of the year; and one could tell within a little how much it was necessary to extend the gas-producing power day by day or week by week. But during the past few years, this practice had altogether altered. The ordinary 5 or 6 per cent. (which generally, to his mind, proved the success or non-success of a company year by year) was not sufficient in these days. The increase in consumption one day over another, or one week over another, could not be taken at anything so low as 5 per cent. In Croydon they had now something like 3000 cooking and heating stoves on hire out of about 9500 consumers; so that in these days it was more a question of temperature than of hours of light and darkness. He had known—and many other engineers present had known—that it was not an uncommon thing for the consumption of gas in a town one day over another to show an increase of something like 30 or 40 per cent. One day might be muggy and warm, and there would be scarcely a gas-stove alight; while the next day, it might freeze hard, and then there would be in Croydon something like 1000 heating-stoves in use, irrespective of cooking-stoves. Taking these stoves to consume something like 20 cubic feet per hour, if they were all put into use together on one day, it would mean that the Company would have to increase their output by 20 per cent. for those stoves alone. It was therefore very essential that, to enable a gas company to carry on their work economically, they should have a large storage to cope with any such considerable increase. The policy adopted by his Directors in ordering such a large gasholder was therefore warranted and justified. Referring to its construction, he said the tank was a large and fine one, inasmuch as from the first moment it was filled with water—from 6 to 7 million gallons—as far as they could judge by careful tests, it had not lost $\frac{1}{16}$ inch. The holder had been filled twice with air; and it did not show the slightest signs of decrease, which proved that the work had been carried out in a thorough and first-class manner. He concluded by speaking in commendatory terms of the help rendered to him by his chief assistant (Mr. D. H. Helps) and all who had been concerned in the carrying out of the extensions.

Alderman RYMER proposed "The Gas Industry." In doing so, he said that his connection with the local governing bodies extended over 25 years; and during the whole of that period, the relations between the authorities and the Gas Company had been most happy and satisfactory. He sketched the early history of gas-lighting, and expressed the opinion that, with the extraordinary strides that had been made in chemical science and with the exertions of the gas engineers, the industry would be well able to maintain its own.

Mr. H. E. JONES, the Engineer of the Commercial Gas Company, in responding, said that in the gas industry they had had parlous times of late. Some seven years ago, their industry was made the theatre of the eight-hour movement, which led to several troublesome and terrible strikes, and a period of great anxiety. The Croydon Company escaped that, and so did the Company he represented. They then came to a period when things were a little better; but all hopes of this continuing were dashed to the ground by succeeding strikes in the coal-fields. The last five years had brought into the gas industry more strikes than he could recollect during his connection with it, which, he regretted to say, now extended to above 30 years. He referred to the drop in the price of sulphate of ammonia, and said coke was not so valuable as it used to be; but, in spite of all these things, there were many circumstances that gave them courage for the future. The working man had taken to them; and they had become democratic to a degree that he never expected by the introduction of the pre-payment meter. Two years ago, his Company began to fix penny-in-the-slot meters. In six months, they found that, instead of having to give a bonus to the people who introduced the customers for these meters, they were overwhelmed with orders. They had 1000 fixed at the end of six months; and now, in two years, they had 2500. At the present time, they had still 1000 unsatisfied applications; and they had been coming in during the last few weeks at a rate approaching 100 a week. At the other end of the string, they had the incandescent gas-light, which, he could say without the fear of contradiction, would cope with any illuminant. He should like to pay his tribute of praise to Mr. Helps, than whom, among the younger leaders of the profession, no one was more honoured. Some people, he believed, had been unduly anxious about the size of the new gasholder. But such holders were really cheap; and the Company had been doing a great service to Croydon by investing their capital on storage at a cost of about £11 per 1000 cubic feet, as against £20 to £30 for a smaller holder.

Mr. T. RIGBY, in proposing the toast of "The Contractors," gave some interesting information regarding the holder. He said that, in the construction of the tank, the quantity of excavation was 31,000 cubic yards; the bricks used numbered 1½ millions; the concrete was about 1600 cubic yards; and the clay puddle 4500 yards. The tank had given employment to between 200 and 300 men every week. The area of the surface of the plates of the holder was nearly 98,000 square feet, which would cover a plane surface of 2¼ acres. The length of iron in the bars, angle-irons, and tees in the holder, if placed end to end, would reach about 7 miles; and in the standards, 8 miles. There were 625,000 rivets in the holder, and 17,000 bolts. Not a single accident of importance had happened during the whole course of the work.

Mr. BASIL P. ELLIS replied on behalf of Messrs. Aird and Sons and Mr. C. C. WALKER on behalf of his firm—the former gentleman stating that, by favour of the Board and Engineer (Mr. C. Gandon) of the Crystal Palace Gas Company, they were able to obtain the clay required for the tank from that Company's works.

Among the concluding toasts was that of "The Visitors," which was proposed by Mr. JACKSON, and responded to by Mr. JAMES GLAISHER, F.R.S.

THE DISASTROUS EXPLOSION IN THE STRAND.

The Inquest on the Fireman—Evidence as to the Cause of the Explosion.

Considerable public interest was manifested in the investigation which was opened on Monday last week, at the St. Clement Danes Vestry Hall, by Mr. JOHN TROUTBECK, the Coroner for Westminster, into the circumstances attending the death of Martin Ernest Sprague (aged 27), a member of the Metropolitan Fire Brigade, who met with the injuries to which he succumbed while searching the ruins on the scene of the explosion in New Church Court, Strand, on Tuesday, the 29th ult., as reported in the JOURNAL last week.

The legal representatives of several interested parties were present, and offered their assistance to the Coroner in his inquiry. Mr. MONIER-WILLIAMS appeared for The Gaslight and Coke Company; Mr. DEBENHAM, for the New River Company; Mr. R. G. GLENN, for Sir John Hutton, the freeholder of part of the property affected; Mr. W. M. THOMPSON and Mr. A. LINCOLN REED, for various injured persons; and Mr. J. S. RUBINSTEIN, for Mr. G. A. Loveridge, of 329, Strand, whose premises and some employees were injured. Mr. SPENCER, the chief officer of the Public Control Department of the London County Council, watched the proceedings on behalf of that body.

After the usual formalities,

Mr. MONIER-WILLIAMS desired at once to say that the Directors of The Gaslight and Coke Company wished to give every assistance in their power; but until the ground was opened, and the mains were capable of being inspected, it was impossible for them to offer any opinion or evidence which could help the Court. They also desired to express their great regret that this calamity had happened.

Engineer *Henry Thoburn*, of the Metropolitan Fire Brigade, was the first witness. He deposed as to the circumstances under which they were called to the scene of the disaster about 7 p.m. on the 29th ult., and gave information as to the collapse of the buildings Nos. 26 and 27, New Church Court, and the burying of Sprague under the *débris*. When witness arrived, one building (No. 26) was in flames.

Superintendent *James Pearce* stated that, when he arrived at New Church Court, the front and back walls of No. 26 were entirely down; and the side walls were badly fractured. There was fire under the *débris* in the court. The second house (No. 27) afterwards collapsed without any warning, bringing with it the remaining portions of No. 26. On the muster-roll being called, it was found that deceased was missing. Efforts to rescue him were at once made. It was not, however, until 3 o'clock the next morning that they traced his whereabouts; and, owing to the peculiar position in which he was fixed, it was about 5 o'clock before they could release him. He was still conscious, and was at once removed to King's College Hospital. When witness reached the court, there was no sign of fire, except from the wreckage lying in the court. He had no doubt that the explosion was caused by gas.

The CORONER: Why do you say that?

Witness: There was a blue flame issuing from the wreckage; and small explosions kept taking place. He thought there was no doubt the pipes were fractured. He was so satisfied there was a great quantity of gas escaping, that he asked an inspector of police to send to the Gas Company's offices; and very shortly some of the Company's employees arrived. They cut off the gas, which took some considerable time, as the ground had to be opened at either end of the court. There were occasional bursts of flame until the gas was cut off; but afterwards there were none. The air smelt very strongly of gas; and the nature of the damage to the houses on the opposite side of the court led him to the conclusion that the explosion was due to gas. He believed, by the way the gas escaped from under the wreckage, that the supply-pipe had been fractured. There were no gas-fittings in the houses that were destroyed.

By Mr. RUBINSTEIN: It was difficult to tell whether No. 27 fell in consequence of another explosion, or by the weakness caused by the first one. He had not seen any part of the fractured pipe. It ran under the pavement in the centre of the court. He could not say that the pipe was fractured by the *débris* falling upon it; but it was not far underground.

Mr. *P. C. E. Tribe*, House Surgeon at King's College Hospital, gave evidence as to the nature of the deceased man's injuries. He stated that the cause of death was the continuous pressure on the chest, and exhaustion and shock.

Mr. *W. G. Perkins*, a Surveyor in the Architect's Department of the London County Council, produced plans showing the walls that were blown down, and those still standing. The walls were 14-inch ones, and were constructed of "place" bricks, which were of a soft nature. The mortar had no adhesive quality whatever, and was quite "rotten." In his examination, he found the vault of No. 27 was about three parts full of rubbish; and the brickwork in the wall of the vault running parallel with the court was fractured, and had started forward below the spring of the arch. The mortar there was quite white, which showed that the fracture had been caused recently. He could only account for this fracture by an explosion in the vault. He noticed that the ceiling was blackened in one corner; and he thought this had been done lately. The lower portion of the wall bulged from the court inside the vault.

The CORONER: There could not have been an explosion in the ground outside the wall; and if there was an explosion inside the vault, it would have caused the wall to bulge the other way.

By a JURYMAN: He did not notice any fracture in the arch of the vault. It had been used as a coal-cellar; but not recently.

Mrs. *Brands*, a married woman, who was living at 26, New Church Court, stated that she was in her room at the time of the explosion; and she was precipitated into the court with the wreckage. She noticed a smell of gas both inside and outside the house on the previous Friday, and spoke about it on the Monday to the landlord's rent-collector (Mr. Pollard). The smell continued to the time of the explosion; and it was worse just before it occurred. When witness made the complaint to Mr. Pollard, she did not hear his reply. There were no gas-fittings in the house. The explosion made a very loud report; and the house fell instantly. She afterwards observed flames issuing from the wreckage. Some two months ago, there was water in the cellar of No. 26.

By Mr. RUBINSTEIN: The Water Company's men were working in the court on the Friday before the explosion; and it was on that day, she first noticed the smell of gas. The men closed up the hole they made on the same day; but the surface was not left in its original state. Men were again working there on the Tuesday morning—the day of the explosion.

In reply to Mr. MONIER-WILLIAMS, witness said she had not had occasion to complain of the smell of gas before the Friday referred to.

Alice Gay, a single woman, also a resident in No. 26, deposed that there was a strong odour of gas in the house for some four or five days preceding the explosion. Witness was in one of the top rooms at the time it occurred. She had been out just before 6 o'clock; and, on returning into the court, she spoke to a Mr. Scourfield about the smell. Witness saw the watermen at work on the Friday; and it was after that she first noticed the smell of gas.

Mr. MONIER-WILLIAMS (interposing) said he had just received information that the Water Company's men were opening the ground in the court to discover a leakage of water; and he thought, if the Coroner had power, it would be well to stop any interference with the court until every person who was interested in this matter could be present to see the condition of the mains.

The CORONER did not know what his powers might be under the circumstances; but he thought it was a very improper course to open up the main in the absence of an interested Company.

Mr. DEBENHAM undertook that the work should be suspended; and shortly afterwards he announced that this had been done.

C. E. Neal, one of the tenants of 27, New Church Court, stated that, when his wife called at the rent-collector's house to pay the rent, he remarked: "Mrs. Neal, it's a wonder you have not all been blown up before this." He saw the Water Company's men digging a hole; but he was more interested in the rats taken out than anything else.

James Scourfield, an engineer and caretaker at the *Weekly Times and Echo* offices, which back on to the wrecked buildings, deposed that he noticed the smell of gas on the 18th ult.—a week previous to the time that the New River Company's men commenced working—and detected it here and there all through the court. On the following night, the office was filled with gas. He was very anxious about it; and, on inquiring of Mrs. Neal whether she had detected gas, she said it was very strong in her rooms. He had had water under the boilers in his machine-room; so that he knew there was something wrong with the water-mains. When the watermen had the hole open on the 25th, they tried the joints of the exposed portion of the gas-pipe; and he was satisfied there was no escape from them. Between 12 and 1 o'clock on the Monday, he spoke about the smell to some of the Gas Company's men who were in Burleigh Street; and they visited the place, but failed to find the leakage. Witness told them that, if they returned in the evening when the pressure was increased, they would smell it much stronger; but he did not see them afterwards. Val de Travers's men were in the court on Tuesday (the 29th). In the evening, about 6.20, witness spoke to one of them with reference to the matter; and the man told him he had noticed the smell of gas all day, but it did not come from the hole that had been made. When the explosion occurred, he was indoors. He ran out, and saw a blue flame rising about 10 feet from the ground. He was sure this was from the hole that had been opened, or, at all events, it was pretty close to it. However, he did not think the leakage of gas was at that spot; but, in his opinion, it travelled there. The ground had sunk underneath the pipes where the hole was made; and he should think it was through this that the breakage of the pipe occurred.

Questioned by Mr. RUBINSTEIN, witness said the first time the water ran into his place was on the Friday. The hole made by the New River Company's men was, roughly, 4 or 5 yards long and 2 yards wide. The gas and water pipes were 10 to 12 inches apart, and some 16 to 18 inches deep.

By Mr. MONIER-WILLIAMS: The hole was a large one; and the men brought four or five loads of material to fill it up, independent of what they took out. The earth had subsided quite 10 inches beneath the main. There were two gas-lamps in the court; but frequent trouble was experienced with one of them, and it was constantly extinguished. It was possible that, when it was not alight, some of the escaping gas might get blown down. He did not see the Gas Company's men in the court on the Monday evening.

Mr. MONIER-WILLIAMS said he should produce evidence to show that the Company's men were there on two occasions that evening, and took every possible precaution. To witness: If you smelt gas so strongly, why did you not give the Gas Company notice before?

Witness: I did not think it my duty.

In answer to Mr. DEBENHAM, witness said he heard there were some dead rats taken out of the hole.

Mr. DEBENHAM: When the hole was opened, four or five dead rats were found, which points to the fact that there was a sudden rush of water, which drowned them.

Mr. *T. Hawkins*, a builder, said he repaired the two houses for Sir John Hutton in 1893; and he subsequently rented them from Sir John. The rents were collected for him (witness) by Mr. Pollard; but he had never had any report from him as to an escape of gas.

Captain *J. S. Simonds*, the Chief Officer of the Metropolitan Fire Brigade, who arrived on the scene of the explosion within half an hour of its occurrence, described its effects and the extent of the damage. In searching for the deceased fireman, they had to proceed with the utmost caution, owing to the dangerous surroundings. He testified to the earnestness with which the men worked in their endeavour to extricate their comrade, and showed that it was owing to the peculiar manner in which Sprague's legs and feet were wedged that so much time elapsed before he was released.

It was then agreed to adjourn the inquiry for a fortnight. In the meantime, the mains in the court are to be stripped for examination, in the presence of representatives of The Gaslight and Coke Company, the New River Company, the County Council, and other interested parties.

"RINGS" FOR THE PURCHASE OF RESIDUAL PRODUCTS.

In the report which was published last week of the proceedings at the meeting of the Manchester City Council on the previous Wednesday, it was stated that the Gas Committee had passed a resolution to obtain statutory powers to enable them to undertake the manufacture of residual products. We learn that an explanation was given on the occasion by Mr. Alderman Gibson, the Chairman of the Committee, as to the reason they were proposing to engage in this—to them— new business. He remarked that he was one of those who for a long time was opposed to the Gas Committee undertaking the manufacture of residual products, especially with regard to the making of sulphate of ammonia. So long as they had an open field and an open market, he was much opposed, as a general rule, to local authorities becoming manufacturers of anything that could be done as well by private enterprise. But when private enterprise got the Committee by the throat, and said they would only be allowed to live under certain conditions, and only permitted them to do what it pleased, the time had arrived when the Committee must look out for themselves. On the last occasion when they advertised for tenders for the ammoniacal liquor, they only received one offer, which had to be accepted. This led them to think that a sort of "ring" had been formed by the manufacturers; and the Committee were determined to show that they could carry on this manufacture themselves. By the powers they sought, they would also be able to use some of their residuals. Under the same circumstances, the Committee could distil their own tar. The Committee's action was (as mentioned last week) approved by the Council.

The *Manchester City News*, commenting upon the above decision, says: "The reason given for the proposal was that only one tender had been received for the ammoniacal liquor produced at the gas-works; the conclusion being that a 'ring' of chemical manufacturers had been formed for the purpose of arranging amongst themselves as to the price that should be paid and who should be the purchaser. . . There is good reason for believing that 'rings' exist for the purchase of other products of the gas-works—tar amongst the rest—and that these nefarious arrangements are not confined to Manchester by any means. It is apparent that Alderman Gibson and his colleagues of the Gas Committee are fully aware of the existence of these rings, and have taken the only course to defeat them, by asking for powers which will enable the Committee to be entirely independent of outside users of gas residuals."

The Supply of Water at the East-End of London.—At the meeting of the London County Council last Tuesday, the Parliamentary Committee presented a report on a resolution of the Council, asking them to take measures with a view to obtaining legislation to raise the limit of the East London Water Company's supply to a height of (say) 70 feet from the nearest pavement. The Committee stated that they thought it preferable that the Company should be made subject to the provisions of the general law contained in section 35 of the Water-Works Clauses Act, 1847, which requires that a supply of water shall be constantly laid on at such a pressure as will make it reach the top storey of the highest houses within the limit. They said they had instructed the Parliamentary Agent to draft the Bill and prepare the notices on these lines; and their action was approved.

Stonehouse and the Devonport Water Company.—Negotiations are on foot for the transfer to the Stonehouse District Council of the rights of water supply exercised within that township. It is stated that, though the Company have statutory rights of supply in Stonehouse, and have laid down a number of mains, they have never had a large body of customers outside the Government establishments which they supply. Under the powers of their recent Act, the District Council have arranged for a present and future supply from Plymouth, which will practically make them independent of the Devonport Company. Before, however, they can claim the right to supply all consumers, the Council must, of course, buy up the Company's rights and the mains. These, it is said, were offered to the late Local Board for £16,000—a price which was considered too high. The Company now, however, claim £74,000; and the probability is that the question will be referred to arbitration. Mr. G. F. Deacon, M.Inst.C.E., has been engaged by the District Council. Mr. Bidder, Q.C., and Mr. Balfour Browne, Q.C., have been retained to represent the Council in the event of the failure of the negotiations for a friendly settlement of the matter.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of the proprietors in this Association was held at the Cannon Street Hotel, London, E.C., on Tuesday last, under the presidency of the Rt. Hon. Sir JULIAN GOLDSMID, Bart., M.P.

The SECRETARY (Mr. G. F. Thompson) read the notice calling the meeting, and the following report of the Directors:—

The following summary shows the results of the Association's operations for the half year ended the 30th of June last:—

	Millions Cubic Feet.
The quantity of gas made in the half year ended June 30 was	4,347
The quantity made in the corresponding half year of 1894 was	4,196
being an increase of	151
or at the rate of 3·6 per cent.	
The total number of lights on June 30 amounted to there being at that date 163,963 consumers on the books of the Association.	2,250,974
At the close of the corresponding half year of 1894, the number of lights was	2,172,428
which gives an increase of	78,546
or at the rate of 3·6 per cent.	
	Miles.
The entire length of mains on June 30 was	1,806
The length of mains laid on June 30, 1894, was	1,763
an increase of	43

The profit of the past half year exhibits a small increase upon that of the corresponding period of last year; and the Directors are pleased to report that signs are not wanting, in most of the towns lighted by the Association, that business activity is increasing, and a healthier tone prevailing than has existed for some time.

The consumption of gas shows a gratifying increase; and the receipts have augmented. But, as this increased consumption is principally due to the more extended use of gas for purposes other than lighting—for which purposes a reduced charge for gas is made—the ratio of profit to working expenses is somewhat smaller.

During the half year under review, the cost of coal has been somewhat less; and the receipts for coke and tar have increased. But the heavy fall in the market value of sulphate of ammonia has adversely affected the revenue derived from the sale or treatment of ammoniacal liquor.

The winter of 1894-5, as remarkable on the Continent as here for the severity of the weather, subjected the power of production of the plant and the capacity and condition of the mains, to an exceptional test; and the Directors are glad to report that, due to their liberal provision of producing plant, and the constant supervision of the engineering staff over the mains, both plant and mains stood that test in a most satisfactory manner.

At Berlin, the new gasholder at the Association's Schöneberg works was completed; and further progress was made in remodelling the principal works in the Gitschinerstrasse.

At Antwerp, the new gasholder-tank at Berchem was completed; and further additions to plant, rendered necessary by the contemplated closing of the Esplanade works (referred to in the last report), were proceeded with.

The Directors are pleased to report that where they have been enabled to introduce the system of supplying gas through prepayment meters, it has so far met with a fair measure of success.

They have sold surplus land at Amsterdam, Ghent, Rotterdam, and Vienna.

The Directors desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended the 30th of June last. These have been duly audited; and from them, the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association and the portion thereof applicable to the purposes of dividend, which they now recommend to be declared, as follows: A dividend of 5 per cent. for the half year ended the 30th of June last, and a bonus of 1 per cent., both payable (free of income-tax) on and after the 2nd day of December next.

The CHAIRMAN, in moving the adoption of the report, remarked that it spoke for itself, and it was satisfactory—showing that the business of the Association for the half year had been good and sound. In fact, he could fairly say that, as far as his knowledge went, the business of the Association had never been more carefully looked after, or more thoroughly superintended in every detail; and he thought that the prospects were in every way good. Nothing of any importance had happened in the course of the period under review; and the same remark applied to the period which had elapsed since the closing of the accounts—namely, the 30th of June last. He would, therefore, go at once to a matter which he desired to mention to the shareholders for the first and last time. He was elected a Director of the Association 27½ years ago; and he had worked for it as, he believed, he had never worked for anything else. At that time they had arduous law-suits at Berlin. They had as Chairman Mr. Attwood, with whom it was not always easy to get on; and subsequently, when that gentleman resigned, they had as Chairman Mr. Twells, who was a charming man, but whose health constantly prevented him from attending to business. The result was that for two years he (the Chairman) discharged Mr. Twells's work when that gentleman was Chairman. Then, nineteen years ago, he (the speaker) was honoured by his colleagues in electing him Chairman. Therefore, one way and another, he had served the Association for 21 years as Chairman, and 27½ years as a Director. This year, unfortunately, he had had a most serious illness—so serious that, at one time, it was thought utterly impossible that he could get over it; and although the malarial fever from which he had suffered had left him, as had also other troubles, he had rheumatic gout, which troubled him greatly, and which the doctors assured him would, in all probability, trouble him for a long time. The effect was that he was very much incapacitated from any business or any worry—in fact, any occupation. The doctors had further said that it was his duty to give up everything involving going away from home, and everything which induced worry or excitement. He had, therefore, had to give up a very large number of engagements; and, to his intense regret, it had become his duty to resign that day the chairmanship and directorship of the Association. He would like to say—and this was why he had come to the meeting that day—that he had been most loyally supported by excellent colleagues during many years. They had worked with him with willingness, readiness, and heartiness; and the staff, both at home and abroad, had always been ready to do anything he had desired. At the same time he was one of those men who felt that, if there was anything important going on, he must be there. When negotiations were pending for contracts and other serious matters, he used to rush off, and at a moment's notice travel sometimes for 48 hours, in order to attend to the business. All this, of course, he could not possibly do now; and, under the circumstances, the only course that remained for him to adopt was to leave the work in more capable hands. He had the same confidence in the future of the Association that he had frequently expressed from that chair; and if the past conservative policy was continued, as he had no doubt would be the case, he was sure that the opportunities of successful work would be as good in the future as they had been in the past.

Mr. T. H. G. NEWTON, the Deputy Chairman, seconded the motion, observing that he did so with very different feelings to those which had actuated him on any previous occasion. The Board had heard for many years the remarks of the Chairman with pleasure, even greater than the shareholders had experienced, because the Directors had known beforehand the tale which the storyteller was going to relate. As those who best knew the play, could best value the talents of the actor, so it had been in the case of the Directors. To-day their pleasure was mingled with, if not overcome by the pain all must feel at the physical effort by which the Chairman had endeavoured to give them that pleasure again; and at his announcement of the termination of his connection with the direction of the Association. He (Mr. Newton) would not now venture to say anything as to the influence which the Chairman had exercised over the destinies of the Association for the long period he had mentioned; though as he had been Sir Julian's colleague ever since the Chairman had been on the Board, he knew how great that influence had been. The Directors collectively, himself and other members of the Board individually, had done all they could to stave off the resignation of the Chairman—even on any terms as to work and service. But knowing the Chairman as he did, he could very well understand that Sir Julian felt that the time had come when his resignation was inevitable; and as such they must, therefore, one and all receive it. He thought that the prolongation of the meeting for one unnecessary minute was trespassing unduly on the kindness of the Chairman in having attended the meeting at all.

The CHAIRMAN invited discussion; but no questions were asked. Thereupon he put the motion, which was carried unanimously. He afterwards proposed a dividend of 5 per cent. for the half year ended June 30 last, with a bonus of 1 per cent., on the £3,800,000 stock of the Association, payable (free of income-tax) on and after the 2nd prox.

Mr. J. HORSLEY PALMER seconded the motion, which was carried unanimously.

Mr. M. S. PILCHER, on behalf of the shareholders, expressed the deep regret with which they had heard the announcement by the Chairman of his resignation. He proposed a resolution recording the shareholders' sincere regret, and cordially thanking the Chairman for his great services to the Association in the past.

Mr. R. HESKETH JONES, J.P., seconded the motion. He could thoroughly endorse what had been said respecting Sir Julian's great capabilities, and the way in which he had managed the companies with which he was connected. It was with sincere regret that the shareholders heard of his resignation.

The motion was carried unanimously.

The CHAIRMAN briefly expressed his obligations for the resolution.

Mr. G. BARRETT then proposed, and Mr. A. MANSER seconded, a vote of thanks to the Chairman and Directors for their services during the past half year.

The CHAIRMAN, in reply, assured the proprietors that the Directors were all much obliged to them. He afterwards proposed a vote of thanks to the staff—remarking that they had some most able men, who had served the Association for many years, who were devoted to the interests of the Association, and who had made it the great success it had been. They would remember that, when he joined the Association 27½ years ago, they paid 10 per cent. upon a capital of £1,200,000; while they now paid 12 per cent. on a capital of £3,800,000, and they had a considerable issue of debentures and debenture stock. This showed how largely their operations had extended, and yet (if he might say so) how well their business had been managed—a fact owing, to a great extent, to the care, attention, diligence, industry, and devotion of the staff.

Mr. BASSETT seconded the motion. Incidentally, as an old Director, he said he had never worked with any Chairman who had given himself up so entirely to the interests of a company as their Chairman had done to the interests of the Association. It was with profound regret that he and his colleagues parted with so excellent a Chairman.

The resolution was carried unanimously; and the proceedings then terminated.

COLONIAL GAS ASSOCIATION, LIMITED.

The Annual General Meeting of this Association was held on Monday last week, at the London Offices, Clement's House Clement's Lane, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. G. J. Gray) read the notice convening the meeting. The Directors' report, which was taken as read, showed that the profit for the year ended June 30 last amounted to £3096, including the dividend on the shares held by the Association in the Charters Towers Gas Company. The Directors also mentioned that the Managing-Director (Mr. J. Coates, M.Inst.C.E.) had strongly advised that the Association should take immediate advantage of a specially favourable opportunity which presented itself for the erection of gas-works in Western Australia; and for this purpose they proposed to issue £5000 of debentures.

The CHAIRMAN, in moving the adoption of the report and accounts, expressed regret that the Association had not met with the amount of success in the past year for which they had hoped. But the troublesome times Australia had been passing through during the last two or three years was still being felt; and, although there were now most

encouraging signs that a better state of things was gradually arising, he had to confess that it had not reached them. Their excellent Manager (Mr. G. Swinburne), in a full report to the Directors, lamented that, with all the economy he had exercised, he had been unable to show a better return than that now presented, which in effect gave about the same result as last year's working in the way of profit, and enabled the Directors to pay a dividend for the year at the rate of 3 per cent. The profit in the previous year was increased by a sum of about £500, which was made for the Association by the Managing-Director. Unfortunately, they had not been able to repeat this in the past year; and the consequence was they were not in a position to pay the same dividend by ½ per cent. The Directors had hoped that the consumption of gas would have increased sufficiently to have maintained the previous rate of dividend; but, through the causes already mentioned, and others, this had been impossible. The competition from oil lighting was still very keen, added to which the Directors had been obliged, in making the new contracts with the Municipalities, to grant a reduction in the price; and, in order to keep their customers, they were compelled to charge them a lower figure. He thought the soundness of this policy must commend itself to all the shareholders. It would have been most gratifying to the Board if these reductions had put them in the position to give a better return on the capital invested; but, under the circumstances, they were thankful it had not caused them to pay a less rate than that now recommended. They were now hopeful they might steadily improve the revenue, and gradually return to a higher percentage. He should like to mention that this was their seventh year of working; and, during that time, the average dividend had been nearly 5½ per cent. If the prospects of improving trade in the Colony continued (and they were entitled to think it would), they had every reason to hope that a better condition of things would ensue, to the delight of the Directors and the Manager, and to the satisfaction of the shareholders. This they were most anxious to see brought about, as it would enable them to ask the shareholders to sanction a further issue of shares for the purpose of acquiring more works; and, by this means, they would increase the revenue. It would have been noticed by the report that they had a favourable opportunity of extending their operations to a small extent. As, at present, they could not hope to make a further issue of shares, the Board were desirous of raising £5000 by means of debentures; and they trusted the shareholders would give them their assistance in the carrying out of such a desirable scheme. In conclusion, the Chairman said that he had received a letter from Mr. Swinburne, dated Sept. 26, in which he reported that all the works were in good order, and that the business was now assuming a more settled appearance. In his opinion, they had now reached the bottom, and might expect an increase in the consumption of gas. The leakage, he also mentioned, was about 9 per cent.; and it would be less in the current half year. Mr. Swinburne ended his letter by saying that he considered the Association had well weathered the storm; and time would slowly bring them into a more prosperous era.

Mr. COATES, in seconding the motion, said he had recently returned from a trip round the world, and had devoted most of his attention to Western Australia, which was advancing by "leaps and bounds," due doubtless to the wonderful gold boom in the colony. While there, he saw, in new and rising towns, excellent opportunities of extending the operations of the Association; so that they might make a profit which would certainly lead to a better dividend next year than this. He had also visited the American continent; and there he saw equally good opportunities of investment, especially in British North America. What they wanted was capital. If the Directors and shareholders could at once place at his disposal £10,000 to increase their operations in the Colonies, he would promise them that the Association would speedily occupy a far more important position in the gas world, and particularly in the eyes of the investing public. With regard to their present operations and works, the majority of which happened unfortunately to be in the Colony most affected by the fearful depression—viz., Victoria—he found everything going on excellently and well. It had only been with the greatest economy on the part of their able and energetic Manager (Mr. Swinburne) that a dividend of 3 per cent. on the year could be declared. He had visited some of the stations, and found them to be in good working order. The chief fault he had to find was that kerosene lamps had been largely substituted for gas. Kerosene was a considerable competitor; and his hope was that the Welsbach light would kill that business. He found that in Canada the incandescent light had, in the case of another Company with which he was connected, increased their consumption of gas by 10 per cent.; and they were continually supplanting the electric light. They were fighting electric lighting there on the best possible terms—the best for electricity, and the worst for gas. For instance, they had three electric light companies, whose plant was driven by water power; and he did not know of any place in Australia or England where the electric light had water power for a town of 50,000 inhabitants. If the Association could only get these incandescent burners in Australia at 10s., instead of £1 or £1 5s., they would soon make a difference in their consumption. He found that the Melbourne Gas Company, who used to divide 22½ per cent., were now paying 10 per cent.; and he was afraid this year they would only pay 8 or 9 per cent. Taking the average of the past five years, the Colonial Association had paid 5 per cent. He did not believe there was a more economically managed Company than theirs existing in London. He had seen signs of returning prosperity; and he thought the worst had passed.

There was a little discussion regarding the proposed issue of debentures. It was thought by Mr. Curry to be an inopportune time to extend the operations of the Association; and he considered it would be better to make an effort to raise the money by ordinary shares. Mr. Coates, however, argued that the only way to advance the interests of the Association was by taking up new and rising towns; and he was supported by Mr. Barker and Mr. White.

The motion was carried.

On the proposition of the CHAIRMAN, seconded by Mr. W. C. PARKINSON, a dividend at the rate of 3 per cent. per annum (free of income-tax) was declared.

The retiring Directors (Mr. A. G. Hammack and the Hon. Thomas Bent) and the Auditors (Messrs. Alfred Lass, Wood, and Co.) were re-elected.

On the proposition of the CHAIRMAN, a hearty vote of thanks was passed to Mr. Swinburne and to the Australian Committee; and, on the motion of Mr. SAWARD, a similar compliment was paid to the Chairman and Directors.

CAPE TOWN DISTRICT WATER-WORKS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Wednesday, at Winchester House, E.C.—Mr. J. S. PRINCE in the chair.

The SECRETARY (Mr. G. H. Rippin) having read the notice convening the meeting, the report of the Directors, briefly alluded to in the JOURNAL last week, was presented.

The CHAIRMAN, in moving the adoption of the report, stated that the gross revenue for the year ending in June was £13,380, as compared with £10,411 in the preceding twelve months; and the sale of water had produced £12,420, as against £9022. In this, however, was included a sum of £2490 received for water supply to the Cape Town Municipality, as compared with a sum of £1000 the year previous. This source of income might not, however, occur again, as the municipal reservoirs on Table Mountain were approaching completion; and should the supply prove sufficient for the requirements of the increasing population, there might then be no occasion for any further application to the Company. The number of houses supplied for the year ended June 30, 1894, was 1544; whereas for the past year it was 1907, showing an increase of 363. Since that time, fresh applications had been constantly received. In addition, there were more than 1200 houses in the Municipality of Woodstock which were supplied in bulk. There had been 4518 yards of new mains laid, at a cost of £1229, and upon satisfactory terms as regarded the minimum guarantee. The whole of the Company's property was in excellent order. Referring to the accounts, there had been a considerable reduction in the cost of pumping last year, as compared with the preceding twelve months, owing to certain alterations in the engines suggested by the Manager; and when the additional cylinders were attached, the Directors had every expectation that further economies would be shown. In the meantime, it was gratifying to have to record an increase in the quantity of water pumped of 33 million gallons, at a lessened cost, as far as coal alone was concerned, of £342. In conclusion, he expressed the opinion that the business of the Company would continue to increase, perhaps beyond the expectations of some persons. South Africa was rapidly advancing in progress and prosperity; and the attractions of the discoveries of gold and diamonds were inducing large numbers of people to try their fortunes and settle there.

Mr. GIBSON seconded the motion.

The CHAIRMAN, in putting the motion, said he had omitted to refer to the local Directors and Managers. He wished to bear testimony to the great interest they took in the affairs of the Company, and the very earnest manner in which all the members of the staff carried out the duties entrusted to them.

The motion was carried unanimously; and a dividend at the rate of 3 per cent. per annum on the ordinary shares was declared.

NEW WATER-WORKS AT LAUNCESTON.

A new water supply for Launceston was inaugurated on the 31st ult. by a ceremony in which the Mayoress (Mrs. Kittow) took the principal part. The new works were rendered necessary by the inadequacy of the supply, and the extension of the towns on the levels which the old works were not high enough to reach. After much consideration, the Corporation decided some time ago to seek a new source, rather than attempt to extend the old works. The site selected was Carne Down, in the parish of Altarnun, about ten miles from Launceston. Here a number of springs rise direct from the granite formation. These have been collected into clear-water tanks; and they yield a supply equal to the present wants of the borough. But, in order to provide for future contingencies, the Corporation have acquired the entire rights to a stream which flows near, and can be used to supplement the springs. At the intake, the water passes through filter-beds, and flows thence through a 6-inch main to a service reservoir on Windmill Hill—a lofty eminence within the borough. This reservoir, which is circular, has a capacity of 350,000 gallons, which is equal to about three days supply. Its bottom and sides are of clay puddle, with a concrete lining coated with cement. A pressure-reducer has been fixed; but, by means of a bye-pass, the water can, if necessary, be made to run direct from the source into the town. There is a fall of 203 feet from Carne Down to Windmill Hill; and the service reservoir is 360 feet above St. Thomas's Bridge, the lowest part of the town, and 140 feet above the centre of the business quarter. The works have been carried out under the direction of Mr. S. Jenkin, of Liskeard. The land required for the intake works and the stream were given to the Corporation by Mr. T. Hugh Spry; but they have had, at considerable cost, and after long and tedious arbitration proceedings, to compensate millowners, whose rights in the lower portion of the stream are interfered with. The total cost of the works, including water rights and easements, and the purchase of the Windmill Hill, part of which will be laid out as pleasure grounds, is £10,500. At the inaugural ceremony, the Mayoress was presented with a gilded key by Mr. Jenkin; and she turned on the water. An address was presented to the Mayor (Mr. John Kittow), by members of the Council, in which it was stated that the scheme owed its initiation, and mainly its successful termination, to the practical and energetic assistance he had given to it. A gold bracelet suitably inscribed was also presented by the Corporation to the Mayoress, as a memento of the occasion. The Mayor, in a short speech, said he had no misgivings as to the works. Gaugings taken in the driest season showed that 200,000 gallons per day would flow into the reservoir—sufficient to give 30 gallons per head until the population reached 5000; and then they could easily, from the same source, double the supply.

METROPOLIS WATER SUPPLY.

Proposed Alteration of the Metropolitan Water Supply Regulations.

In response to a request from the London County Council, Colonel DUCAT, R.E., opened an inquiry on behalf of the Local Government Board, at the Guildhall, Westminster, on Thursday, the 31st ult., as to the efforts which the London County Council are making to secure certain alterations and amendments in the regulations made by the Water Companies under the Metropolis Water Act, 1871, the chief one relating to the substitution of a three-gallon flushing-cistern for water-closets in place of one of two gallons now generally employed.

Mr. G. M. FREEMAN represented the London County Council; Mr. PEMBER, Q.C., Mr. C. A. CRIPPS, Q.C., M.P., and Mr. RICKARDS appeared on behalf of the associated Water Companies.

Mr. FREEMAN said this was an application by the London County Council to the Local Government Board to alter, amend, and add to in certain respects, some of the regulations made by the Water Companies, under the 19th section of the Metropolis Water Act, 1871.

Mr. PEMBER interposed to ask Mr. Freeman if he were sure he and his department were right in proceeding absolutely under that section; and to suggest a doubt as to whether section 22 had not a bearing on the matter.

Some further conversation followed, in the course of which the Inspector expressed the opinion that only one—the Kent Company—came under that section; and Mr. Pember said he merely mentioned the point in order that the Council might not, by proceeding under section 19, find the inquiry abortive.

Mr. FREEMAN (continuing) said the original authority in respect of making regulations was contained in the Metropolis Water Act, 1852, by section 26 of which it was provided that the Companies could from time to time, and with the approval of the Board of Trade, make such regulations as might be considered expedient for preventing waste, misuse, &c., of water. Section 19 of the Act of 1871 gave the power under which the present proceedings were taken. The regulations under the Act of 1871 were made in 1872, and had therefore now been in force some 23 years. They were framed at an inquiry at which the Metropolitan Board of Works and the Corporation of London were present. But a very considerable change in engineering science and requirements had taken place since then, particularly in regard to the sanitation of houses; and what was then thought to be satisfactory and sufficient, had turned out to be inadequate and dangerous. The question of increasing the capacity of the flushing-cisterns of water-closets arose in 1892 out of a communication sent to the London County Council by the District Board of St. Giles's. This letter was considered; and the Council consulted their Engineer and Medical Officer of Health. A reply was sent entirely concurring in the Board's views, and stating that the Council would take what steps were possible to support them. Since that time, the Council had received communications from nearly every Vestry and Board of Works in the Metropolis, practically endorsing those views. Having satisfied themselves that there was a substantial case, the Council communicated with the Solicitors for the associated Water Companies. Besides this particular matter of the increase in the size of cisterns, the officers of the Council found, in the course of their inquiries, that there were several others of great importance which it would be desirable to include in the alteration of the regulations. The result was that they now had four proposals before them. There were in many places, particularly in buildings of a public nature, sinks which were used for the reception of solid and liquid matter—not slop sinks, but sinks where perhaps chamber utensils were emptied from time to time. The Council therefore desired that, wherever this was the case, the sinks should be brought under the same regulations, as to having a flush of water, as if they were closets. The next regulation was to prevent cisterns which supplied closets or sinks such as he had described from being used for directly furnishing water for domestic purposes or for the consumption of animals. Under the present regulations, such cisterns could not be constructed; but there were no regulations which prevented cisterns already in existence from being used for these purposes. The last of the alterations was very important. It was that, in all cases where a constant water service was now being given, there should be placed on the rising main one or more cocks or taps for obtaining drinking water for domestic use. This was a matter to which he was happy to say the Water Companies seemed to have no practical objection. On Feb. 28, 1894, the Council sent a circular-letter to each of the Companies, embodying the four matters of which he had already spoken. To this they received a letter from the Companies' Solicitors, dated April 16, 1894, stating that the proposed increase in the quantity of flushing water would cause an enormous addition to the consumption, and that at the time the regulation was fixed two gallons were taken as the outside quantity that would be required. The letter went on to state that the Companies confidently anticipated being able to show that two gallons were sufficient for one flush; while, as regarded the other matters mentioned in the Council's letter, it was the desire of the Companies to comply with any requirements that would add to sanitary efficiency without involving waste. Counsel contended that the two-gallon flush did not clean out the pan sufficiently; the result being that something remained. In these circumstances, a man would use the flush again; so that, instead of two gallons, probably four would be used. If, however, three were sufficient, one would be saved if the three-gallon cistern were used; and this must be set off against the statement of the Companies regarding the enormous increase. Passing on, Counsel referred to the case of Bradford, where it was found necessary, for the well-being of the town, to increase the capacity of the flushing-cisterns from two to three gallons; and there were other places where this had been done. The Council wrote again to the Solicitors to the Companies; and on May 31 last they received a reply to the effect that the proposed regulation for preventing cisterns connected with water-closets being used to supply water for domestic purposes did not appear to concern the Companies, and that they would have no means of enforcing compliance, while in regard to placing taps on the mains they had no objection to offer. Other correspondence followed; but as the last letter of the Council was not answered, the Local Government Board were applied to in October, 1894, to order an inquiry. Letters had been received from some twenty local authorities in the Metropolis generally supporting the Council's proposals. In conclusion, he said that the Companies were not supplying the water by meter, but on the basis of the rating of the houses; and it was their bounden duty to furnish such a quantity as was reasonably and properly required for the adequate treatment of the sanitary appliances in those houses. If, therefore, it was made clear that the present supply was not sufficient, it was the duty of the Companies to accept such regulations as would make it so.

Mr. *C. F. Doll*, architect and surveyor, of No. 86, Gower Street, said he was a member of the St. Giles's District Board of Works and of the St. Pancras Vestry. Before living at No. 86, he lived at No. 74, Gower Street, where was a two-gallon flushing-cistern. A stoppage occurred; and on the drain being opened, he was so struck with the insufficiency of the flush that he had a three-gallon cistern put up in place of the two-gallon one. The Inspector of the New River Company objected at first; but he eventually consented to the larger cistern. Witness went on to detail the steps by which the matter was taken by him before the St. Giles's District Board, and through that Board to the Board of Trade, the County Council, and other bodies; and he epitomized the correspondence which ensued. Continuing, he stated that, as an architect, he had frequently had to consider the present question, and had come to the conclusion that the two-gallon flush was insufficient, because, by experiment in his own house, he had found that this would not clear the drain, or even, in many cases, the pan. In his experiment, he used a wooden ball in a 50-feet drain, with a 1½-inch flush-pipe and a wash-out tank. Even then the ball did not get as far as the interceptor. The drain was a 6-inch stoneware pipe; and the inclination was about 1 in 50. He then substituted the three-gallon cistern, and brought the matter into the interceptor without difficulty. Two gallons might clear out with absolutely new pipes, if laid at proper inclination. In his experience, it was the general rule that the 1½ or 1¼ inch flush-pipe, suggested by the Companies, was used; and this was the smallest size supplied. The efficiency of a flush depended rather on its force than on the quantity, as regarded clearing the apparatus. As to the increase in the consumption of water which it was thought would result from the adoption of the proposal, he asserted that, where a two-gallon flush was in operation now, the majority of people used it twice; so that there was a loss of a gallon of water.

Cross-examined: In his experiment, he had a downflow pipe of 1¼ inches. The cistern was about 5 feet above the pan. The outlet went into the falling soil-pipe. The ball was made of deal, and was 1¼ inches in diameter. He could not say how many seconds the flush took to operate, though this was a matter of great importance. The closet used was a patent; but he did not know that it required avowedly a three-gallon flush. The bulk of the houses on the Bedford Estate in Bloomsbury were fitted with 1½-inch pipes, and he had not had any complaints from the residents there, because, in defiance of the regulations, he had placed three-gallon flushing-tanks in the houses. He knew very few two-gallon closets; and such as he did know were constantly being complained of. He should be astonished to hear that the Water Companies were specially exempted from flushing sewers or drains.

Mr. PEMBER stated that this was so in the case of all the Companies but one.

Witness (continuing) said he agreed that the bath water and slops helped to flush the drains; but the soil-pipe from the closet usually entered the drain above the pipe from the bath-room, which was therefore of no assistance.

In re-examination, witness stated that the New River Company took no action in regard to the three-gallon cisterns on the Bedford Estate until the present proceedings were threatened.

Dr. *J. F. Sykes*, the Medical Officer of Health for St. Pancras, strongly supported the proposed substitution of three-gallon cisterns in place of those now existing. The change would, he said, be beneficial in clearing the basin, the trap, and the drain. After a two-gallon flush, the pan was often improperly cleared. He had had this experience that morning in that very building. The larger flow would be of immense advantage in poor districts. In general, witness confirmed the evidence of the previous witness.

Mr. *W. J. Berry*, Surveyor, of the Estates and Valuation Department of the County Council, said he had charge of the artizans' dwellings of the Council. He also supported the three-gallon system, which he said he had tested. In a block of the Council's buildings at Yabsley Street, Poplar, there were 50 closets and 50 tenements; the population being about 170. There was a three-gallon flushing system geared down to supply two gallons. In Beachcroft Buildings, Ratcliff, which were also Council property, there were 40 tenements and 40 closets, and the population was about the same as at Yabsley Street. Here the cisterns were of three-gallon capacity. Roughly speaking, the arrangements at the two places, except as to the size of the cisterns, were similar; yet at Yabsley Street Buildings there had been 21 stoppages in seven months, while not one occurred at Beachcroft Buildings.

Mr. *S. Buck* and Mr. *Le Brun*, the superintendents in charge of these buildings, confirmed this statement.

Mr. *A. R. Binnie*, M.Inst.C.E., the Chief Engineer of the London County Council, stated that, while he was the Engineer to the Corporation of Bradford, exhaustive inquiries were made in regard to water supply, and a regulation was framed raising the quantity to be used for flushing from two to not more than three gallons. In his opinion, nothing less than this quantity would suffice for London. He thought it would rather lead, as it did in Bradford, to a saving, because now practically two flushes of two gallons each were used to do what three gallons would effect.

Cross-examined: In nearly all of the cases in Bradford where the two-gallon flush was unsatisfactory, the pipe was a 1¼-inch one, and the fall varied from 3 to 10 feet—5 feet being the average.

On the resumption of the inquiry on the following day,

Dr. *Shirley F. Murphy*, the Medical Officer of Health for the County of London, was the first witness called. He said he had considered the matter of the cisterns; and his impression was that the two-gallon

flush was insufficient for the purposes sought to be effected. He spoke from general experience, and not from any special experiments. In various institutions, notably hospitals, there were slop-sinks, which were practically water-closets, and should be brought under the regulations applying to them. Witness supported the proposal that no cistern used for domestic purposes or for cattle should be allowed to communicate with a closet.

Mr. PEMBER pointed out that this was a matter with which the Water Companies had nothing to do.

Mr. FREEMAN asserted that they could make a regulation to enforce this proposal, and, in case of non-compliance, could decline to lay the water on to such a cistern.

Mr. PEMBER said the contamination of water which it was sought to prevent was not contamination which would occur while the water was in the Companies' mains, but would take place after its delivery. The Companies did not say it was not important; they merely contended that they had nothing to do with it—that it was outside the scope of their Acts of Parliament.

The INSPECTOR intimated that he rather took Mr. Pember's view of the matter; but he wished to have time to consider it.

Witness went on to express approval of the proposal of the Council in reference to fixing taps to the rising-main, when,

Mr. PEMBER said he doubted very much whether this matter was a proper regulation to be added to those made in 1871. He was anxious to repudiate any notion that the Companies differed from the public generally as to the advisability of this proposal, or of the one last mentioned, being carried out; but he did say that both proposals had nothing to do with the matter in hand.

Witness was then cross-examined. He stated that a flush should thoroughly clear the pan, and empty the trap; and the emptying of the drain, so far as it could be done, should also be included in the list of requirements. He knew houses where the closet arrangements complied with the requirements of the Companies, but where the two-gallon flush was insufficient. He could not, however, give off-hand any instances. It might be possible to construct a closet with a two-gallon cistern which would go far towards securing what was wanted; but, in practice, things did not do what they were supposed to do. He thought, therefore, that water must be found by the Companies to flush all closets which came within a reasonable regulation. He did not, however, say he should give up the task of making suitable fittings, and rely upon the water. The fitting which used the least water, if it was equally good in other respects, was the best. There were structures called "slop-sinks," and were definable if regard were had to their use. Scullery sinks were used for receiving solid or liquid filth.

Some discussion followed as to what was meant by the word "filth."

Mr. FREEMAN, in order to make what the Council desired clear, said the new regulation he would ask for in regard to this matter would be: "The expression 'water-closets' in these regulations includes any sinks used for the reception of any solid or liquid excreta." He also asked to have struck out of Regulation 20 the words "other than water-closets in which flushing is employed."

Mr. *W. E. Groom*, the Sanitary Inspector to the Camberwell Vestry, said in his district, where there was much poor property, the two-gallon flush was insufficient to clear the water-closets. It was a very ordinary thing for the flush not to carry the contents through the trap, and sometimes not to clear the pan. The small supply of water was not merely an inconvenience, but a danger to health. He had complained of this for a long time, and had formed an opinion that the three-gallon flush would remedy the defect.

Mr. *C. Tagg*, the Clerk to the Vestry of Camberwell, gave evidence as to the Vestry being in favour of the alteration.

Mr. *F. Blashill*, F.R.I.B.A., the Superintending Architect for the London County Council for Metropolitan Buildings, said he had much to do with large blocks of houses; and, in his opinion, two gallons of water were insufficient to flush a closet, as excreta often remained in the pan afterwards. Three gallons would, he thought, be effectual. Even if the fittings were proper, two gallons would be insufficient. In designing artizans' dwellings, he had had to consider what sort of closets he should place in them; and to do this he had tried the waste-preventers and closets of as many as ten different makers. He selected five as apparently efficient. They were used in the Yabsley Street Buildings and the Beachcroft Buildings; and he thought they would give a fair test if the set in one block were compared with the set in the other. It was the duty of the Companies to supply a reasonable quantity of water; and this, in his opinion, was not done with a two-gallon flush.

Cross-examined: Knowing that closets were frequently not scientifically perfect, there should be a margin in the amount of flushing-water. It depended a great deal on the class of persons using a closet as to whether or not it acted properly, because very often, with children and ignorant people, a large quantity of paper was used. He thought the Sanitary Institute would have no difficulty in arriving at a correct conclusion as to the best form of closet to be employed, regard being had to the fact that only two gallons of water were to be used for flushing purposes. It would, however, be monstrous to make the class of closet selected compulsory for the future. He said this because all closets up to the present had not proved to be perfect; and he did not suppose that that one would be absolutely satisfactory.

Mr. *Keith D. Young*, F.R.I.B.A., said he had had considerable experience as an architect, chiefly in connection with hospital work. In order to thoroughly flush out the pan, the trap, and the soil-pipe of a water-closet, they must have a flush of 2½ gallons at least. Even in regard to the best form of closet known, the amount of the flush ought to be increased. Slop-sinks should be flushed; and the majority of such sinks in hospitals should have a tap as well.

Cross-examined: There was a closet in existence which, when used by ordinary persons, would be sufficiently flushed by the flow of two gallons of water. But in cases of illness, or in unusual circumstances, that flush would not operate properly. Hospital slop-sinks were flushed by means of a "jelly-bag" arrangement and a tap, which was not sufficient. He should not put up a slop-sink anywhere, except in a hospital or some similar institution.

Mr. *J. W. Clarke*, a registered plumber and a Liveryman of the Company of Plumbers, said that in 1881 he became Honour Medallist in plumbers' work. He was a member of the Sanitary Institute, and a lecturer on plumbing at the Polytechnic Institution. He had had 28 years' practical experience, and had come to the conclusion that, even with a good closet, a two-gallon flush was insufficient. It did not always clear the basin, particularly when this was dry. The cleanliness of a closet was added to very much if a three-gallon, instead of a two-gallon, flush were used. The trap, moreover, was generally cleared with a three-gallon flush.

Mr. *Rogers Field*, M.Inst.C.E., said he believed he was the first member of the Institution of Civil Engineers who took up the study of the details of the sanitation of buildings; and he had had large experience of drainage arrangements in connection with public institutions and private houses. The inquiry in 1872, when the regulations of the Water Companies were drawn up, was conducted before a Commission. He studied the report very carefully, to ascertain precisely why two gallons were fixed as the proper quantity of water to flush with; but he had been unable to discover any reason. It appeared that someone proposed a gallon and a half. The City Corporation suggested two gallons; and the Companies said: "Let it be so." The waste-preventers were wanted in order to avoid the waste caused by the old stool taps, which was simply immense. His attention being called in his work to the fact that closets of the best form which he had erected were not working satisfactorily with a two-gallon flush, he increased it wherever he was not stopped by the Companies—first to two-and-a-half and then to three gallons. He was strongly desirous of seeing the three-gallon cistern used. Scientific experiments were good, if they were controlled by practical experience; but no experiments could give the information that could be obtained from daily practice. He was a member of the Committee of the Sanitary Institute, which, in 1893, carried out certain experiments in regard to the quantity of water necessary to flush a closet. They showed the advantage of a three-gallon over a two-gallon flush. Gradients were laid, partly of pipes and partly of open channels; and into these drains, which were of different lengths and inclinations, water was turned from a closet-basin and flushing-cistern—the basin and cistern being chosen as good ones. The two-gallon flush passed away in about five seconds; and the three-gallon flush in seven seconds. The same apparatus was used throughout. The cistern was 4 ft. 3 in. above the pan, and a 1¼-inch pipe was used. The efficiency of the flush was tested by means of soft soap, cocoa fibre, and clay, placed in the basin. The two-gallon flush did not always clear the trap and drain-pipe. It left 5 per cent. of the material there; while only 1 per cent. was left by a three-gallon flush. His experience in regard to the closet at his own house agreed with this result. The Committee came to the conclusion that two gallons were not sufficient for a flush, and that the minimum should be placed at three gallons. Witness then dealt with other experiments which had been made by the New River Company and by the Kent Company in reference to the same matter. Continuing, he said one of the chief reasons for adopting the three-gallon flush was its effect on the drain, apart from the pan, &c. In order to ensure the excrement falling into the water, the water surface had to be increased in area, with the result that more water had to be used. With reference to slop-sinks, he supported the Council's proposals, and stated that it was only recently that he had been able to procure proper apparatus to flush them.

Cross-examined: He could not give the names of any closets which were kept out of the market owing to the two-gallon flush being insufficient for them. The experiments of the Sanitary Institute were not stopped because the County Council wanted the results by a certain date, but because the land on which they were being carried out was required.

Dr. *W. Y. Orr*, the Medical Officer of Health for the Wandsworth District Board of Works, said his Board were in favour of the regulations being altered so that the discharge from each waste-preventing apparatus should not be less than two, nor more than three-and-a-half gallons at each flush.

Dr. *W. Corfield*, Professor of Hygiene, and Medical Officer of Health for St. George's, Hanover Square, said that, even with a closet having a 1¼ or 1½ inch fall pipe, and with a full opening into the pan, a two-gallon flush was not sufficient. The way in which the handle or plug was pulled made a difference as to the effect of the flow. Where there was only a two-gallon flush, it was necessary to use automatic flushing-tanks to keep the drain clear. They were placed at the head of the drain, in the back yard, so that there would be no saving of water used for the whole of the drain. It was desirable, however, that the whole flush should be "in one hand." For pan, trap, soil-pipe, drain, and disconnecting trap, the three-gallon tank was requisite.

Cross-examined: He knew of automatic flushing-tanks to the extent of some hundreds. They were located practically all over London, and particularly at the West-end. Some were in the district of St. George's, Hanover Square; and the Water Companies covering the district were the Grand Junction and the Chelsea. He thought the best form or type of closet was one of the sort required under the model bye-laws of the Local Government Board—one which had a large water service.

The inquiry was then adjourned till the following Monday.

On the resumption of the inquiry on the 4th inst.,

Mr. *Blashill*, recalled, gave the names of the makers, ten or eleven in number, from whose samples the closets for the model buildings of the County Council were selected. They were all tried with a three, not a two gallon flush, as he had previously stated. The five which were selected worked well with a three-gallon flush.

Cross-examined: They were all of the wash-out or short hopper type of closet.

Dr. *L. Parkes*, the Medical Officer of Health for Chelsea, said he had been requested to attend the inquiry by the Metropolitan Branch of the Incorporated Society of Medical Officers of Health. He had had much experience of the flushing of closets, especially in connection with the London Hospital, Whitechapel. All the closets in that building had been removed; and, on his recommendation, new ones of the short hopper type substituted, with flushing-cisterns of three gallons capacity. The closet he selected was one in which there was a large area of water into which the excreta could fall without touching the sides. In a closet

where there was not such a large water area, the sides became foul very much more quickly. Where there was a deep seal, as would be more likely with the three-gallon than the two-gallon flush, there was less liability to syphonage. A three-gallon flush would permit of an increase of seal from 1 inch to 1½ inches. It was important to have a flush which would not only clear the pan, but prevent syphonage. He did not think there was any advantage, except in special cases, in having a larger pipe than one of 1½ inches in diameter.

Cross-examined: He believed the two-gallon flush was common over nearly the whole country. If syphonage could be avoided, it was better to have the water in the trap as shallow as possible. The best, but most expensive, way to prevent syphonage was to ventilate the trap.

Mr. *H. Robinson*, M.Inst.C.E., Professor of Civil Engineering at King's College, said he had been in practice as a sanitary engineer for the past thirty years. His attention had been particularly called to the fact that household drains were often very foul. This, he thought, was due mainly to the insufficiency of the flush. Rods and automatic flushing-tanks had been constantly used to remove the obstructions. With regard to the experiments of the Sanitary Institute, they were unreliable, owing to the conditions under which they were made. The proposed increase in the flush would not augment the consumption of water to so great an extent as was thought, because with the two-gallon flush there were, in many instances, twice as many flushings as there would be with one of three gallons. If the size of the flush-pipe were altered from 1½ to 1½ inches in diameter, the difference would not be appreciable, because it would only make the flow about half a second shorter.

Cross-examined: One of his reasons for advocating the three-gallon flush was that house drains were often defective. The proper remedy for clearing the drains in the present state of the law was an automatic flushing-tank. A three-gallon flush would be sufficient to cleanse the drains in small houses—at all events, it would be more effective than two gallons; and in the larger houses there would be assistance from bath water.

This concluded the case for the County Council. Evidence on behalf of the Water Companies was immediately taken; and this will be reported next week.

The Water Supply of Perranporth and St. Agnes.—It is reported that the scheme for supplying these villages with water obtained from Silverwell, to which reference was made in the JOURNAL for the 29th ult. (p. 892), has been abandoned.

Exhibition of Gas Appliances.—An exhibition of Messrs. Richmond and Co.'s gas stoves and appliances is now being held at the Armoury, Huddersfield. It was opened, on the 1st inst., by the Corporation Gas Engineer (Mr. W. R. Herring), in the absence of Alderman Stocks. Mr. Herring made a few appropriate remarks, in which he described coal gas as the universal artificial illuminant. He said that possibly within the next twenty years people might be supplied with gas without what was called illuminating power at all; that being derived from the mantle of the incandescent light. The cost of gas chiefly arose from having to put into it a high illuminating power; but, if his surmise should prove to be correct, then gas could be supplied by the Corporation at half its present price. In connection with the exhibition, cookery lectures have been delivered by Miss Richmond.

Rosario Water-Works (New) Company, Limited.—The seventh ordinary general meeting of this Company was held last Tuesday, at the London Offices, 52, Moorgate Street, E.C.—Mr. J. Morris presiding. In moving the adoption of the report and accounts, the Chairman said there was an increase in the profits of £1090; but additional working expenses left them with only £415 to the good. There was a net balance of a little over £9000. After debiting the net revenue account with debenture interest in full, trustees' fees, and interest on loans, there remained a deficiency of £4575 for the year, which increased the total debit against net revenue account to £40,620. He commented on the hopeless position in which the ordinary shareholders were placed, and remarked that, in the opinion of the Directors, the time had come when something should be done, if possible, to make an arrangement with the debenture-holders, with a view to putting the Company on a better basis. The motion having been carried, a resolution was brought forward to the effect that a Committee composed of debenture stockholders be appointed to confer with the Directors as to a scheme for dealing with the existing and future arrears of interest, with a view to an equitable arrangement as between debenture stockholders and shareholders. This was unanimously agreed to.

Basingstoke Water Supply.—An inquiry on behalf of the Local Government Board was recently held in the Town Hall, Basingstoke, in reference to an application by the Corporation for power to raise £16,000 for the construction of new water-works according to a scheme prepared by Mr. H. Rofe, M.Inst.C.E., under the instructions of the Corporation. The Town Clerk (Mr. W. H. Bayley) stated that the Corporation had purchased the works from the late Water Company; but they did not include a pumping-station and engines. They had to pay a heavy rent for having the water pumped; and it had been considered that it would be better to have their own establishment and do their own pumping, &c. The interest on the money they would lay out would not be so much as they were now paying; and they would, moreover, be acquiring a valuable property. They also proposed, under the new scheme, to provide a more constant supply for the higher parts of the town. Two members of the Corporation, as well as the Mayor (Alderman W. Powell), gave notice of opposition to the scheme on behalf of different sections of the ratepayers, who, in public meeting, had passed a resolution adverse to it. Mr. Rofe submitted his plans, specifications, estimates, &c. He proposed that a pumping-station should be erected at Sherborne Bottom, on the north side of the town, and the water pumped to a reservoir about three miles on the south side, which would ensure a constant supply to the highest parts by gravitation. Mr. Dowling, the Chairman of the Water Committee, also gave evidence in support of the scheme; while Mr. Smith, a councillor, strongly opposed it as unnecessary and too costly. The inquiry was ultimately adjourned for a month.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The workman gas director question, which Mr. George Livesey raised a few months ago, has been advanced a stage at Leith. At the municipal election on Tuesday, they elected as a Town Councillor Mr. Patrick Kelly, gas worker. Mr. Kelly stood, of course, as a working man candidate. His opponent was a wine merchant; and the majority by which he was returned was 107—567 to 460. So far Mr. Kelly, as a Town Councillor, has nothing to do with the gas-works; but he is eligible for appointment to the Edinburgh and Leith Gas Commission, as one of the representatives of Leith on that body. The election is fixed by statute to take place on the third Tuesday of November, which, this year, will be the 19th inst. If the Leith Town Council should send Mr. Kelly to the Gas Commission, the position would be that he would be virtually the superior of Mr. Linton, in whose employ he is, and whose orders he is bound to obey. If he were endowed with common sense, there might be no harm in the arrangement; but should he become a demagogue and a meddler, the consequences might be unpleasant—to himself chiefly, I should say. Should he not be placed on the Gas Commission, he might, were he so disposed, take up a position from which to harass the Gas Commissioners; or he might, on the other hand, endeavour to promote their interests in the Town Council. The position must be a very trying one to Mr. Kelly; and in consideration of its bearing upon Mr. Livesey's question, his doings will be worth keeping in view.

The municipal elections are now over; and matters which have been stirred up during the contests will for the most part retire into obscurity. It is satisfactory to note that in none of the large cities in Scotland was there much more than a passing reference to matters connected with gas supply. It was only in the smaller places that these subjects were prominent. The electors of Dunfermline were singularly quiescent, when it is considered that the Corporation are contemplating acquiring the gas undertaking. That was due to the notion having been circulated that it was not necessary, though they should adopt the Gas Act, that they should proceed with the transfer. There has been great heat over the gas question at Forfar. I am afraid the result of the election does not improve matters much, but that we may look for a renewal of the bickerings which have of late made the meetings of the Forfar Gas Corporation very different from what business meetings should be. At Hamilton there has been a great deal of speaking upon the Corporation gas undertaking. The question which agitated the candidates was that of extensions at the works, with an occasional incursion into the regions of finance and the quality of the gas. I know no place where there is less occasion for cavilling at the gas supply. Both sides of the question have been dealt with at Broughty Ferry; some asserting that the gas undertaking is being well conducted, and others that it is not. In all these instances, whatever question of public interest was raised, the Gas Manager was dragged into the discussions. That was not fair, because in the circumstances the Manager could scarcely afford to take notice of attacks made on him. The gentlemen who were thus dragged before the public will, however, have the satisfaction of knowing that the worst has been said against them in the meantime, and that they will now have comparative peace in which to tackle their winter's work.

I observe that Mr. Mitchell has been retained as Convener of the Glasgow Corporation Gas Committee, with Mr. Stevenson as Sub-Convener. At Aberdeen, Mr. Johnston has been retained as Gas Convener. The only change I know of as yet is at Hamilton, where Mr. Brown has retired from the convenership of the Gas Committee after holding it for three years. He did good work in his time; but he was notwithstanding subjected to a good deal of nagging.

On Saturday last, Provost Chalmers, of Gourock, laid the foundation plate of the new gasholder which the Corporation are erecting to plans by Mr. J. M'Gilchrist, of Dumbarton. The holder is the one which the Corporation last April obtained the sanction of the Sheriff to erect without the necessity of obtaining the consent of the owners and occupiers of property adjoining. At the ceremony, Provost Chalmers was presented by the Contractors (the Airdrie Iron Company) with a silver trowel, by the aid of which he carried through the necessary formalities. He then gave a short address, in which he referred to the formation of a Gas Company in the primitive watering place of Gourock in 1842; and traced the progress and development of gas production down to 1886, when the Commissioners took over the works. Their subsequent tenure had been profitable all round; and now, with increasing requirements, they had to extend their storage capacity. When the prospective tank, which would cost about £3500, was completed, Gourock would be in a position to meet demands for gas for whatever purposes for a considerable number of years to come. In the evening, a large number of gentlemen were entertained to dinner by the Provost in the Ashton Hotel.

On Tuesday of this week, an inquiry was held at Dumbarton into the circumstances attending the death of a lad named Wilson, in the Dawsholm works of the Glasgow Corporation, which are within the jurisdiction of the Sheriff of Dumbartonshire. The narrative of the accident is to the effect that the deceased was an apprentice boiler maker with the Airdrie Iron Company, and belonged to Airdrie. He was employed, along with several other workmen, at the construction of hoppers in the Dawsholm works. The hoppers were on a raised platform; and on a level with them, but on another platform, was a steam travelling crane, which was used for lifting material required in the construction of the hoppers. The casing of the crane, when it was swung round, came about 6 inches over the hoppers, so that anyone coming between the crane and the hoppers would be crushed. In view of this danger, the foreman on the job gave the craneman instructions not to move the crane unless by orders from him; and the other employees were also told that they were not to order the craneman except through the foreman. On Oct. 11, the lad Wilson was standing between the hoppers and the crane, when the latter was swung round, with the result that he was crushed and killed instantaneously. Three witnesses examined at the inquiry were employed on the job at the time of the accident; and they each swore that no order was given to swing the crane, and that there was no

necessity for it at the time. The craneman was not examined. The jury found, in accordance with the evidence, that the lad was accidentally killed by being crushed between the crane and the hoppers, through the jib of the crane being swung round.

An unfortunate accident happened in the Tradeston works of the Glasgow Corporation, on Monday afternoon, by which one man was killed and another injured. A new gasholder is being erected; and workmen were engaged in the removal of a steam crane which had been used in part of the work. They were working with a hand crane, the pinion of which broke off when they began to wind. The jib of the hand crane, when the pinion snapped, came down; and in its fall it struck one of the workmen on the head, killing him instantaneously. Another workman was injured on the legs and left arm. A melancholy feature of the accident was that the poor man who was killed only started work at the breakfast hour that day, and nobody connected with the place knew his name.

Mr. W. Penman, C.E., of Edinburgh, who has introduced a method of applying the Welsbach incandescent gaslight to optical lantern work, by enriching ordinary gas with oxygen, described and illustrated his invention before the members of the Edinburgh Photographic Society on Wednesday. It is just announced, too, that the Royal Scottish Society of Arts have awarded Mr. Penman a silver medal for his discovery.

On Saturday last, the members of the Aberdeen Amalgamated Society of Engineers, to the number of about fifty, visited the Aberdeen Corporation gas and electric light station. The Convener of the Gas Committee (Mr. Johnston) and the Engineer and Manager (Mr. A. Smith) received the visitors, and showed them round the place,

A curious affair happened at Dreghorn, in Ayrshire, on Tuesday night. The gas lights in the district went out; and on a visit being paid to the gas-works, it was found that the gasholder was empty. The Manager could not be found, which gave the occurrence a mysterious aspect. A man with a knowledge of gas making was obtained from Kilmarnock; and the gas supply is again restored.

Dr. John Clark, of Glasgow, the Chairman of the Scottish Section of the Society of Chemical Industry, delivered the opening address of the winter session of that body in Glasgow on Tuesday night. Dealing with the subject of black smoke, he said that very little progress had been made in the movement for its abatement. Even with the use of mechanical appliances, he thought the remedy would be very partial, as there were many fires to which mechanical stokers could scarcely be applied. Unless, he considered, the citizens were prepared to use gas-fires, or to burn coke in suitable stoves, the problem of getting rid entirely of black smoke seemed to be as far from solution as ever.

I am very pleased to be able to refer to the satisfactory working of the Renfrew Corporation Gas-Works, of which Mr. Thomas Lighbody is Manager. The output of gas rose during the year from 11 to over 12 million cubic feet; but the sale of gas increased in a greater proportion, the unaccounted-for gas having been reduced from 13·33 to 8·26 per cent. The coal carbonized amounted to 1345 tons, which, though the output of gas was greater, was 50 tons less than the amount used in the preceding year. This points to a higher yield per ton of coal, which I find increased from 8563 to 8956 cubic feet. There was a total income of £2586, and a gross surplus of £886. Out of this the Commissioners have paid £213 for interest upon capital, and have placed a like sum to the sinking fund. They have also written off arrears to the amount of £69; leaving a balance of £390 to be carried forward. The Commissioners have, in Mr. Lighbody, a gentleman eminently qualified to carry on their work. He passed first-class last year the examination in gas manufacture of the City and Guilds of London; and the Commissioners, in recognition of his services, have advanced his salary.

The municipal election in Arbroath was fought upon the one question of the water supply to the burgh. At present this is pumped from wells in the Nolt Loan; but the supply is only about nine gallons per head per day, and there are doubts as to whether even that can be kept up. A Committee of the Town Council obtained a report by Mr. James Wilson, of Edinburgh, recommending that a gravitation scheme should be adopted. The Town Council, at a recent meeting, agreed to this recommendation. Thereafter the elections came on; and the subject of water supply was made the test. There is a bequest of £200 a year from the estate of a deceased neighbouring gentleman, which the town holds as long as they take the town water supply from the Nolt Loan. The bequest was doubtless a generous one when made; but its folly is seen in that, circumstances having now altered, it places the temptation before the inhabitants of doing with an insufficient supply of water rather than lose a contribution of £200 a year to the rates. This temptation was too strong to be resisted. There are six wards in the town, and all were contested; literal oceans of oratory being poured forth on the subject. The result has been that in every one of the wards the supporters of the Nolt Loan scheme were victorious; and the gravitation scheme is, therefore, in the meantime, at an end. For how long, it is impossible to say, because that depends upon the Local Government Board. They will not continue to tolerate a water supply of only nine gallons per head per day.

Proposed Water-Works for North Walsham.—Mr. J. C. Melliss, M.Inst.C.E., has lately visited North Walsham, with the view of investigating the existing water supply; and he has reported on the subject to the District Council. The district includes several minor outlying hamlets; and the whole parish contains 4252 acres, with about 900 houses and an estimated population of about 3800. The present water supply is obtained from shallow wells, of which there are 170 in the town itself; and they all derive their water from the sand and gravel formations. Mr. Melliss is of opinion that the time has come to obtain water from a purer source; and he recommends sinking a well into the chalk (which may probably be met with in the locality at a depth of 150 feet), care being taken to exclude water from the overlying strata. In addition to a well, a storage reservoir will be required; and this might be placed on high land (144 feet above Ordnance datum) on either the Westwick or the Smallburgh Road. The Council have asked Mr. Melliss to submit an estimate of the probable cost of a scheme of water supply for the district.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 9.

Sulphate of Ammonia.—Throughout the week the market has been quiet; consumers' orders being still rather scarce, and operators for the most part hanging back. Prices have, in consequence, been scarcely maintained. On the other hand, after the larger selling up to late October, there is no great pressure on the part of makers to sell; and they show no disposition to follow the decline further in the meantime. The closing quotations are £8 15s. to £8 17s. 6d. per ton f.o.b. at the ports. There does not appear to be much actual business doing for forward delivery; the views of sellers and buyers as to values having become somewhat divergent. The quiet spot market has made buyers less inclined to purchase ahead, unless at a concession on recent current prices, which makers are not disposed to give.

Nitrate of Soda remains quiet. Spot value of fine quality is still 7s. 9d. per cwt.; and autumn shipment cargoes are worth 7s. 9d. to 7s. 10½d.

LONDON, *Nov.* 9.

Tar Products.—There is more activity in this market. Even carbolic acid, which has so long been a "dead letter," is now very freely inquired for; crystals realizing a slightly better price, while 1d. per gallon more is asked for crude 60's. Pitch is moderately firm. Benzols are in good request; 50 per cent. quality now having come up into line with 90's as regards price. There is a better trade both for xylol and cumol, which points to the production of the old-fashioned scarlets again. A somewhat better tone exists in the anthracene market; and sales of considerable importance are recorded at the full prices quoted by the Committee. The following prices have been noted during the week: Tar, 19s. to 23s. 6d. Pitch, 35s., west coast; 38s., east coast. Benzols, 90's and 50's, 1s. 4d. Solvent naphtha, 1s. 2½d. Toluol, 1s. 4d. Crude, 30 per cent., naphtha, 5d. Naphthalene salts, 25s. to 40s., according to quality. Cresylic acid, white, 1s. 2d.; brown, 10½d. Carbolic acid, 60's, 1s. 7½d.; 75's, 1s. 11d. Anthracene, "A," 1s.; "B," 9½d.

Sulphate of Ammonia.—Notwithstanding the excellent shipments that are going on, and the undoubted increased demand for the article, there seems to be no backbone in respect to its value. Sulphate has changed hands during the week at from £8 12s. 6d. at north-east ports to £8 15s. to £8 17s. 6d. western ports, and £8 17s. 6d. to £9 London—all less 3½ per cent., except Beckton terms. Dealers are anxious to buy for forward delivery; but makers' ideas are largely in advance of current prices.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The upward movement in prices with the commencement of the month has scarcely been so strong as was anticipated. It has barely gone beyond a levelling up to list rates; any appreciable advance upon these being very exceptional. For the better qualities of round coal, the demand has rather fallen off, as compared with the pressure of orders that was in many cases coming forward towards the close of last month. The house-fire coal pits are, however, mostly on five days per week, which is practically full time. As a rule, 10s. 6d. per ton at the pit is now being got for best Wigan Arley; 9s. to 9s. 6d., for Pemberton four-feet and seconds Arley; and about 7s. to 7s. 6d., for common house coals. The lower qualities of round coal still show no improvement; and excessively low prices are now being quoted to clear away surplus quantities—sellers in some instances being willing to take 5s. 6d. per ton at the pit mouth, with 6s. to 6s. 6d. remaining about the average quoted figures. With regard to the Belfast gas-coal contracts, of which I gave some particulars a week or so back, I hear that the prices taken by the Lancashire collieries—who, as previously stated, secured about 80,000 tons—do not average more than 6s. 3d. per ton at the pit mouth for Arley gas coal. The shipping trade in common coals also continues exceedingly depressed, with 7s. to 7s. 6d. per ton taken for ordinary qualities, delivered at the ports on the Mersey, and about 7s. 9d. for delivery at the Partington tips on the Manchester Ship Canal. Engine classes of fuel are meeting with rather more inquiry for iron-making purposes, which is helping to move away the increased quantities of slack now coming upon the market; and prices are steady at 3s. 6d. per ton for medium sorts, and 4s. 6d. to 5s. for best qualities, at the pit mouth.

Northern Coal Trade.—Increased dulness has shown itself in the coal trade of the North during the last few days, more especially in the steam coal branch; and in consequence the range of prices has been lower. On the other hand, there has been a larger demand for gas and household coal. The tendency of the trade may be seen from the fact that many of the best steam coal collieries have not more than half work; while some at least of the gas coal collieries are not only fully employed, but have full work ahead for most of the winter. Best Northumbrian steam coals may now be quoted at 8s. per ton f.o.b., though there have been sales both above and below this price. Second-class steam are about 7s. 6d. to 7s. 9d. per ton f.o.b., and small steam coals, 4s. per ton, with a good demand for the latter, owing to the limited supply. In manufacturing coals, most of the transactions are now for next year's delivery; and for these the price is substantially the same as in the contracts that expire with the year, though for one or two kinds that are preferred for chemical works an advance of 1½d. per ton has had to be paid by several buyers. Gas coals are now nearly at the time of the heaviest deliveries, both locally and for distant ports; and most of the best gas coal collieries are fully employed in the seams that yield gas supplies. The deliveries are, of course, mainly under contracts that are at moderate prices; but for odd cargoes, the general quotation varies from 6s. 6d. to 7s. per ton, while one of the large Wear shipping collieries now asks 7s. 3d. per ton f.o.b. Stocks, however, of gas coal are increasing with some of the companies, though they will be drawn upon in a few weeks. Coke is very firm. The consumption at the local blast furnaces is at about the highest point known, and fair quantities are being sent to the north-west; while the shipments show an increase both from the Tyne and from West Hartlepool. For best coke for export, the price is 14s. 6d. to 15s. per ton f.o.b. Gas coke is being increasingly made now; but the consumption is also higher, and even

the inland companies seem to have smaller stocks than they had a few weeks ago. There is no alteration in the price of gas coke.

Scotch Coal Trade.—Little change is perceptible in the coal trade in Scotland. There is, if anything, a slackening of demand, on account of the shipbuilding dispute which has now extended to the Clyde. Should it last for several weeks, coal will very soon be overstocked, with the probable result of a fall in prices. While this state of matters lasts, the coal trade is being conducted under conditions which have a paralyzing effect. The prices quoted are: Main, 5s. 9d. to 6s. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s.; splint, 6s. 3d. to 6s. 6d.; and steam, 7s. 6d. to 7s. 9d. The shipments for the week amounted to 164,134 tons—a decrease as compared with the preceding week of 16,627 tons, but an increase over the corresponding week of last year of 25,284 tons. For the year to date, the total shipments have amounted to 6,267,032 tons—an increase as compared with the same period of last year of 2,065,953 tons, but a decrease on 1893 of 473,555 tons.

Suffocated by Gas.—A young woman, named Mary Durkin, died at Rochdale, on Monday last week, from the effects of inhalation of gas. She was found apparently dead in her bed-room with the gas-jet turned on, and the room full of gas. After much exertion, two constables restored her to consciousness; but she relapsed into insensibility again and died. It is believed to be a case of accident.

The Public Lighting of Crayford.—At a meeting of the Crayford District Council last Friday, it was resolved to adopt an extended system of public lighting. Mr. Peill moved that tenders be obtained for oil as well as gas lamps; and Mr. Pruden seconded the motion. Mr. Battison and Mr. Miles thought oil would be too dear in the long run. Mr. Brown said oil was certain to be the dearest as well as the most unsatisfactory illuminant. The Erith Council had, by their miserable oil-lamps—"smoky doubtfuls" as they were called—saved £300; but they had had thousands of pounds' worth of grumbling, to the prejudice of the place, because where there was grumbling there was discontent, and people would not live in the place if they could help it. The Gas Company at present charged about £3 per lamp for the year. It was resolved to advertise for tenders for public lighting by gas or oil.

The Proposed Electric Lighting Scheme for Swansea.—As already mentioned in the JOURNAL, the Swansea Corporation have, by a majority of one, decided to adopt an electric lighting scheme. With the view of assisting the ratepayers in forming a sound judgment on the matter, a local paper obtained from "one of the foremost electrical experts in the kingdom" a report in which he gave particulars of two plans which he thought might be advantageously carried out. In the first, provision is made for the production of electrical energy alone by means of steam power produced in the ordinary way; in the second, this is combined with the destruction of ashbin refuse. The estimated capital outlay for the first scheme is £22,625; and a profit of £1539 is reckoned upon the working. This, of course, will have to meet the sinking-fund charges and interest on the capital sunk. Allowing for these matters, the actual profit is put down at £50 per annum, with the certainty of acquiring the plant at the end of 25 years, by which time the capital will have been redeemed. The second scheme involves an additional outlay of £7500 for the destructor, and engineering expenses amounting to £1506; making a total of £31,631. But there would, it is estimated, be a net saving of £762 10s.; and the town would get rid of about 13,500 tons of refuse, which is now more or less publicly collected in Swansea.

The Richmond Main Drainage Works.—A few years ago, the Richmond Main Drainage Board carried out works for dealing with the sewage of Richmond, Barnes, Kew, Mortlake, and Petersham. The whole of the main sewers converge to a point on the south bank of the Thames between Kew and Mortlake, where they are 45 feet below ground-level. The sewers end in a deep sump, in which there were originally three pumps, with space for two more. The wet-weather flow was calculated at 5¾ million gallons a day; but, owing to an increased number of houses in the district, and, perhaps, to the inclusion of more storm water than was anticipated, the pumping power has sometimes been only just able to cope with the flow. The original plant could deal with 11 million gallons a day. This has now been increased to 26 million gallons, by the erection of a pair of triple-expansion vertical Worthington pumping-engines. In addition, a centrifugal pumping-engine has been provided to deal with 5 million gallons on a 20-feet lift, if the sewage-level should rise unduly in the pump-well. A new outfall, capable of delivering 40 million gallons daily, has been constructed to the river, together with bye-pass channels, screening-well, and other works. The whole has been designed by Mr. W. Fairley, Assoc.M.Inst.C.E., Engineer to the Board; Mr. W. B. Bryan, M.Inst.C.E., being Consulting Engineer.

Kingsbridge Water Supply.—The question of the water supply of Kingsbridge has got into a delightful state of confusion. After discussing rival schemes without being able to decide upon any one of them, the District Council recently decided to take the opinion of Mr. Beesley, of London. At a meeting on Wednesday last, Mr. Beesley reported that, in his opinion, it would be useless to continue the excavations at the Loddiswell source; for it yielded only 200 gallons per hour, whereas the town required at least 1500 gallons. He advised the purchase of the Courtland spring for the sum of £3365, excluding compensation. Several members of the Council, however, favoured a resort to Morleigh, whence water could be obtained by gravitation, while pumping would have to be resorted to in the case of the other sources. On the other hand, the Chairman of the Council and other members were strongly in favour of going on with the Loddiswell scheme. A resolution to the effect that steps be taken to purchase the Loddiswell mill, and obtain water from the River Avon, was submitted; but it was rejected. The Chairman suggested that it was now the duty of the majority against that scheme to tell them what was best to be done. To this one of the members replied with the obvious retort that they had the opinion of an expert in favour of one scheme, and immediately proceeded to advocate another. Consideration of the matter was adjourned for a month, on the understanding that the majority against the Loddiswell scheme would be expected to propose a solution of the difficulty.

Enlargement of the Water Storage at Redcar.—The Redcar District Council have resolved to increase the storage capacity of their water reservoir, from 1½ to 2 million gallons, by deepening it. The estimated cost is £1200.

Drainage Works for Arundel.—On Monday, the 4th inst., the Duke of Norfolk laid the foundation-stone of the drainage works now being carried out in connection with Arundel at a cost of between £6000 and £7000. The work is in the hands of Mr. Hill, of Peterborough; and it is expected that it will be completed by June next year. The Duke, after giving the borough a full water supply, has also consented to bear two-fifths of the cost of the drainage work up to £6000.

The Charge for Water.—The following is an extract from a letter which recently appeared in *The Times* on the subject of the charge for water: "It is difficult to make a comparison between the charges of the Metropolitan Companies and those made by municipalities, because in many instances the apparently low rate charged by the latter to the consumer is supplemented by a public rate levied upon all property. For instance, the Liverpool Corporation levy 6d. in the pound for water upon all property in addition to the charge for water supply, which in the case of private houses is 7½d. in the pound, or a total charge of 12½ per cent. more than the East London Company's charge of 5 per cent. The Liverpool Corporation also charge (let the suburban districts of London note the fact) an additional 50 per cent. in all places outside the city, and 5s. 10d. per 1000 gallons for shipping, as against the charge of 6d. by the East London Company, or nearly twelve times as much. Taking gross income, including trade, into account, the average income per supply amounts in East London to £1 13s., and in Liverpool (City) to £1 19s. per annum. Moreover, the East London Company pay 9·59 per cent. of their gross income back to the consumers in aid of rates. Again, in Manchester there is a public rate of 3d. in the pound in addition to the domestic rate of 9d. Curiously, the 3d. rate produces as much as the 9d. rate; so that if the charge were made only on the consumers, it appears that their rate would be 1s. 6d. in the pound, or 7½ per cent. upon the annual value, as against 5 per cent. in East London. In many other towns the charges are greater than in London."

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 969.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	22 - 23	−2	4 11 4
100,000	10	,,	7½	Do. 7 p. c.	10	16½–17½	+½	4 5 8
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	107–109	..	4 11 9
200,000	5	1 May	6½	Bombay, Limited	5	7¼–7⅝	..	4 3 10
40,000	5	,,	6½	Do. New	4	5¼–5⅝	..	4 10 3
380,000	Stck.	14 Aug.	12	Brentford Consolidated	100	253–258	..	4 13 0
180,000	,,	,,	9	Do. New	100	205–210	−2	4 5 8
220,000	Stck.	27 Sept.	11	Brighton & Hove Original	100	227–232	..	4 14 10
933,500	Stck.	29 Aug.	5	Bristol	100	125–130	..	3 16 11
320,000	20	27 Sept.	11½	British	20	54½–55½	+½	4 1 1
50,000	10	29 Aug.	11½	Bromley, Ordinary 10 p. c.	10	22½–23½	..	4 17 10
51,510	10	,,	8½	Do. 7 p. c.	10	18½–19½	+½	4 7 2
328,750	10	12 June	4	Buenos Ayres (New) Limited	10	8¼–8⅝	−¼	4 11 6
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	102–104	..	5 15 5
150,000	20	11 July	8½	Cagliari, Limited	20	31–33	..	5 0 0
550,000	Stck.	26 Oct.	13½	Commercial, Old Stock	100	320–325	+7	4 3 1
165,000	,,	,,	10½	Do. New do.	100	247–252	+1	4 3 4
160,762	,,	12 June	4½	Do. 4½ p. c. Deb. do.	100	143–147	..	3 1 3
800,000	Stck.	12 June	13	Continental Union, Limited.	100	278–283	−2	4 11 10
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	215–220	..	4 11 10
535,000	Stck.	29 Aug.	5½	Crystal Palace Ord. 5 p. c. Stk	100	125–130	..	4 0 9
486,090	10	26 July	11	European, Limited	10	25½–26½	..	4 3 0
354,060	10	,,	11	Do. Partly paid	7½	17–18	..	4 14 3
5,646,590	Stck.	14 Aug.	12¾	Gaslight & Coke, A, Ordinary	100	292–297	+½	4 5 10
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	107–112	..	3 11 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c.Pf.	100	282–287	..	3 9 8
30,000	,,	,,	5	Do, F, 5 p. c. Prf.	100	135–140	..	3 11 5
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200–205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	193–198	..	3 10 9
461,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	282–287	..	3 9 8
476,000	,,	,,	6	Do. K, 6 p. c. Prf..	100	167–170	..	3 10 7
1,061,150	,,	12 June	4	Do. 4 p. c. Deb. Stk.	100	135–140	..	2 17 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	147–152	+2	2 19 2
908,000	,,	,,	6	Do. 6 p. c. do.	100	202–207	..	2 17 11
3,800,000	Stck.	10 May	12	Imperial Continental	100	245–250	..	4 16 0
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	6–6¾	..	4 12 4
560,000	100	1 Oct.	5	Met.of Melbourne, 5 p.c. Deb.	100	113–116	..	4 6 2
541,920	20	12 June	5	Monte Video, Limited	20	18–19	..	5 5 3
150,000	5	24 May	8	Oriental, Limited	5	7½–8	+¼	5 0 0
60,000	5	12 Sept.	7	Ottoman, Limited	5	5–5½	..	6 7 3
166,870	10	14 Feb.	2	Para, Limited	10	1½–2½	..	8 0 0
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	105-110*	..	5 9 1
500,000	100	4 June	6	2nd Do.	100	102—107	..	5 12 1
150,000	10	16 Oct.	7	San Paulo, Limited	10	11—12	..	5 16 8
500,000	Stck.	29 Aug.	15½	South Metropolitan, A Stock	100	370—375	..	4 2 8
1,350,000	,,	,,	12	Do. B do.	100	308 - 313	..	3 16 8
308,685	,,	,,	13	Do. C do.	100	325—330	..	3 18 9
800,000	,,	11 July	5	Do. 5 p. c. Deb. Stk.	100	175—178	..	2 16 2
60,000	Stck.	12 Sept.	11½	Tottenham & Edm'nton, "A"	100	230—235	..	4 17 10
				WATER COMPANIES.				
746,021	Stck.	26 June	10	Chelsea, Ordinary	100	291—299	..	3 6 10
1,719,514	Stck.	16 Oct.	7	East London, Ordinary	100	223—228	..	3 1 5
654,740	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	157—162	..	2 15 6
700,000	50	26 June	7	Grand Junction	50	118—122	..	2 17 5
708,000	Stck.	29 Aug.	12	Kent	100	307—312	..	3 16 11
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	100	250 - 255	−1	2 19 1
406,200	100	,,	7½	Do. 7½ p. c. max.	100	208—213	..	3 10 5
330,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	143—148	..	2 13 4
500,000	100	14 Aug.	12⅝	New River, New Shares	100	385—395	..	3 2 9
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	143—145	..	2 14 2
902,300	Stck.	12 June	4	S'thwk & V'xhall, 10 p.c. max.	100	146—151	−1	2 12 11
126,500	100	,,	4	Do. D 7½ p.c. do.	100	140—145	..	2 15 2
1,155,066	Stck.	12 June	10	West Middlesex	100	293—298	..	3 7 1

*Ex div

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

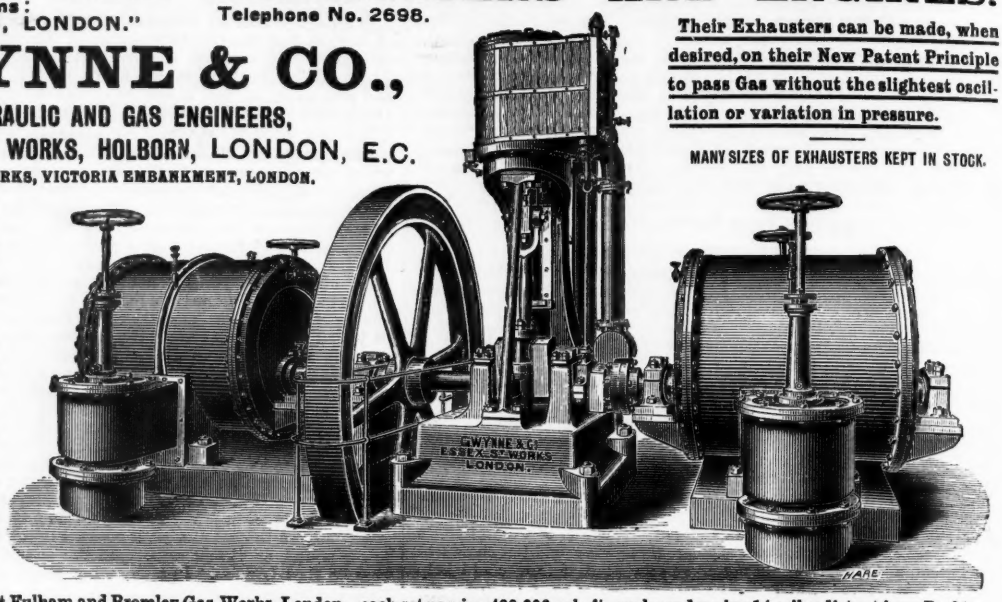
They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.



Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR Wanted. BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted. BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted. BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO. Offices: Commercial Buildings, LEEDS. Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

BACK-PRESSURE IN PURIFIERS.

THE Valve invented by Mr. Cripps for Bye-Passing any Layer of Purifying Material (referred to by the President of the Incorporated Institution of Gas Engineers in his Inaugural Address) can be obtained of the Makers: C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP, and J. EVERY & SON, Phœnix Iron-Works, LEWES, to which Firms all inquiries should be addressed.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs. Before placing Orders, please write for Estimate.

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also Improved Patent Rotary Scrubber-Washers. *** See Advertisement p. II., centre of JOURNAL. Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham. First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c. Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER. Telegrams: "ENAMEL." National Telephone 1759.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER. For all Joints in connection with Oil-Gas Plant and Sulphate Plant. For all Gas Joints. For all Tar Joints. For all Ammonia Joints.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description. Please write for Estimate before ordering elsewhere.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application. 70, CHANCERY LANE, LONDON, W.C.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c. Head Office: MIDDLESBROUGH. Correspondence invited.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application. OXIDE PAINTS, OILS, SULPHURIC ACID, &c. 120 and 121, NEWGATE STREET, LONDON, E.C. Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c. Telegraphic Address: "PORTER LINCOLN."

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron. Two or three times as rich as Bog Ore. Strong action on Sulphuretted Hydrogen. To be used alone, but will increase activity of other Oxides. Less than half the price of Bog Ore. Can be lent on hire. Write for tabulated results. READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

THE Undersigned is in a position to supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonization Process, of which I am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method. J. HARDMAN, Manufacturing Chemist. Milton, Staffs.

Fourth Edition, Revised and Enlarged.

DESTRUCTIVE DISTILLATION: A Manualette of the Paraffin, Coal Tar, Rosin Oil, and kindred Industries. By PROFESSOR E. J MILLS, D.Sc., F.R.S. *Imp. 8vo., 5s.* LONDON: GURNEY AND JACKSON.

A LONDON Firm of Factors desires AGENCIES for Gas and Water Works Specialties and Requisites. Address No. 2595, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS AND WATER COMPANIES.

EXPERIENCED Accountant, Secretary, or COMMERCIAL MANAGER is open for an Appointment, either Home or Foreign. Apply, by letter, to No. 2594, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION wanted, in Gas-Works or otherwise, as SULPHATE of AMMONIA MAKER or STOKER. Thoroughly understands Rectifying Naphtha. Certificated for Engine Driving. Fair Fitter. Good References.

Address E. J. SARGENT, 63, Byrne Road, Balham, LONDON, S.W.

WANTED, by a Married Man, a Situa- tion as MANAGER in Small Works or SMITH and FITTER. Fourteen years' Experience in all Branches. Six years in last Situation. Good References; Abstainer.

Apply to W. HOLDSWORTH, Gas-Works, Thaxted, ESSEX.

WANTED, two good Retort Setters at once, for Midland Counties.

Apply, by letter, to No. 2590, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING Manager wanted for Small Country Gas-Works. Must be a good Stoker, and accustomed to all the duties. Good character indispensable. Teetotaler preferred.

Applicants to state Age and lowest Wages required to No. 2597, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good reliable man, used to working single-handed in a Small Gas-Works. Must be well recommended. Wages, 18s. per week, with Cottage, Coal, and Light.

Apply, by letter, stating Age and if Married, to No. 2598, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Manager for a Small Gas-Works in Cheshire. Yearly make about 1¼ millions. To do all work, including Service laying, taking Meters, collecting Accounts, &c. Wages, 28s. per week, with House, Coal, and Gas.

Apply, by letter, to No. 2596, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS MANAGERS.

THE Directors of the Matlock Bath Gas Company, Limited, require a competent MANAGER of their Works. Salary £100. He will be required to reside at the Works, where a House, Gas, and Coal will be provided.

Applications, stating Age, Qualifications, and enclosing *copies* of recent Testimonials, to be sent to the Secretary on or before the 18th of November.

By order,
A. CLARK,
Secretary.

Matlock Bath, Nov. 8, 1895.

SINGAPORE GAS COMPANY, LIMITED.

WANTED, a fully qualified Gas En- gineer to take over the duties of MANAGER and LOCAL SECRETARY of the above Company in March next (leaving England about the 1st of February). Salary, $400 a month, with good Residence and other Allowances. Three years' engagement.

Applications, stating Age (which must be under 40), Qualifications, together with not more than three recent Testimonials, should be forwarded by Wednesday, the 11th of December, to the undersigned, from whom all particulars can be obtained.

ROBERT M. CHRISTIE,
Secretary.

98, Cannon Street, E.C.

GAS-ENGINE, for Sale—One-Horse Power, by Crossley Bros., equal to new. Removed for larger one.

Apply to W. CLARK, 21 and 22, Middle Avenue, The Market, OXFORD.

TO GAS ENGINEERS.

FOR SALE—A Cast-Iron Pipe Con- DENSER, Twelve Stacks of 7-inch diameter PIPES, Two Lengths of HYDRAULIC MAIN, 24 inches diameter, Fifteen ARCH and DIP PIPES, 5 inches diameter—the same being in good working order, and may be seen on application to the undersigned, from whom full particulars may be had.

MATT. DUNN,
Engineer and Manager.

Selby, Yorks.

GAS PLANT FOR SALE.

THE Corporation of Walsall have for SALE a Set of four PURIFIERS, 10 feet square and 4 feet deep, with Hydraulic Centre-Valve and Connections all complete.

Also a 20,000 feet per hour STATION METER, with Connections all complete.

May be seen at the Wolverhampton Street Works, Walsall.

Any further Particulars may be obtained from
J. TINDALL,
Engineer.

Nov. 8, 1895.

RETORTS AND FIRE-BRICKS.

THE Directors of the Rochester, Chatham, and Strood Gaslight Company are prepared to receive TENDERS for the supply of about 1400 feet run of FIRE-CLAY RETORTS, 43,000 FIRE-BRICKS, 50 TILES, and 60 Tons of CLAY.

Specification and Form of Tender may be obtained from the undersigned, to whom tenders, endorsed "Tenders, &c.," must be delivered on or before Noon, of Thursday, the 5th of December, 1895.

J. M. VEEVERS,
Engineer and Secretary.

Gas Offices: 95, High Street,
Rochester, Nov. 7, 1895.

TO ENGINEERS AND IRONFOUNDERS.

COUNTY BOROUGH OF BURY.

THE Gas Committee of the Corporation of Bury invite TENDERS for the supply and fixing of sundry CAST, WROUGHT IRON, and STEEL MOUNTINGS of Retort-Benches and Stage-Floors, in connection with their Gas-Works at Elton, Bury, pursuant to the Drawings and Specification prepared by Mr. W. H. S. Gendall, Gas Engineer and Manager, from whom further Particulars may be obtained, and also copies of the Specification, with Quantities and Forms of Tender, on payment of One Guinea, which sum will be returned upon receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Tender for Retort-Fittings," to be sent to me the undersigned on or before Monday, the 25th inst.

Preference will be given to those persons or firms who pay to their workpeople the regular standard rate of wages obtaining at the time in the town or district.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
Nov. 1, 1895.

TO RETORT & FIRE-BRICK MANUFACTURERS.

THE Corporation of Bury are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at their Gas-Works.

Forms of Tender may be obtained from Mr. W. H. S. Gendall, Gas Engineer and Manager, Elton, Bury.

Tenders, sealed and endorsed "Tender for Retorts, &c.," to be sent to me not later than Monday, the 25th day of November, 1895.

Preference will be given to those persons or firms who pay to their workpeople the regular standard rate of wages obtaining at the time in the town or district.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
Nov. 1, 1895.

SHEFFIELD UNITED GASLIGHT COMPANY.

NEEPSEND STATION.
No. 2 RETORT-HOUSE.

TO ENGINEERS, IRONFOUNDERS, ETC.

THE Directors of this Company invite TENDERS for the Manufacture and Delivery, without Erection, of RETORT-FITTINGS for 96 Retorts, also PLATES and GIRDERS for Stage-Floor for No. 2 Retort-House at their Neepsend Station.

Drawings may be seen, and Bill of Quantities with Specification and Form of Tender obtained, on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of *bonâ-fide* tender.

Sealed tenders, endorsed "Tender for Retort-Fittings," to be delivered by post to the undersigned, at the Company's Offices, on or before Saturday, the 30th day of November.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Nov. 2, 1895.

SHEFFIELD UNITED GASLIGHT COMPANY.

NEEPSEND STATION.
No. 4 PURIFYING-HOUSE.

TO ENGINEERS, IRONFOUNDERS, ETC.

THE Directors of this Company invite TENDERS for the supply and erection of Four PURIFIERS, 42 ft. by 21 ft., together with Covers, Lifting Apparatus, Valve, and Connections, and also CAST-IRON GIRDERS and COLUMNS to form FLOOR for carrying the same for No. 4 Purifying-House at their Neepsend Station.

Drawings and Specification may be seen, and Bill of Quantities with Form of Tender obtained, on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of *bonâ-fide* tender.

Sealed tenders, endorsed "Tender for Purifiers," to be delivered by post to the undersigned, at the Company's Offices, on or before Saturday, the 30th day of November.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Nov. 2, 1895.

SHEFFIELD UNITED GASLIGHT COMPANY.

NEEPSEND STATION.
No. 4 PURIFYING-HOUSE.

TO STEEL JOIST MANUFACTURERS, CONTRACTORS, ETC.

THE Directors of this Company invite TENDERS for the Manufacture and Delivery, without Erection, of a ROLLED STEEL GIRDER FLOOR, 99 ft. 3 in. long, by 65 ft. 3 in. wide, for their No. 4 Purifying-House at their Neepsend Station.

Drawings may be seen, and copy of Specification with Bill of Quantities and Form of Tender obtained, upon application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of *bonâ-fide* tender.

Sealed tenders, endorsed "Tender for Oxide-Floor Girders," to be delivered by post to the undersigned, at the Company's Offices, on or before Saturday, the 30th day of November.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Nov. 2, 1895.

TAR.

THE Gas Committee of the Hinckley Urban District Council invite TENDERS for the purchase of all surplus TAR from present time to June 30, 1896.

Sealed and endorsed tenders to be sent in to the undersigned on or before Monday, Nov. 18, 1895.

GEO. HELPS,
Engineer and Manager.

Gas-Works, Hinckley.

PURIFIERS.

THE Corporation of Bergen-op-Zoom (Holland) invite, before Dec. 3, TENDERS for the construction and erection of FOUR PURIFIERS and ACCESSORY PLANT.

Drawings and Specifications may be seen at the Office of the Gas-Works Manager, by whom copy of Specification and Conditions will be supplied at a charge of 2s.

TO GASHOLDER MAKERS.

THE Mossley Gas Committee invite TENDERS for the RE-SHEETING of TWO LIFTS and the ADDING of a THIRD LIFT to a Telescopic Gasholder.

The Drawings and Specification may be seen on application to Mr. Merrell, Manager, Gas-Works, Mossley, and at the Office of Messrs. Thomas Newbigging and Son, 5, Norfolk Street, Manchester.

Quantities and Form of Tender may be obtained from the latter on payment of Two Guineas, which will be returned if a *bonâ-fide* tender is sent in.

Sealed tenders, endorsed "Gasholder Contract No. 4," to be addressed to the Chairman, Gas Committee, Mossley, and sent so as to reach me not later than Noon, on Saturday, the 16th of November, 1895.

The Committee do not bind themselves to accept the lowest or any tender.

JOSEPH HYDE,
Town Clerk.

Town Hall, Mossley,
Oct. 31, 1895.

BOROUGH OF STOKE-UPON-TRENT.

TO IRONFOUNDERS.

THE Gas Committee of the Corporation invite TENDERS for the construction and erection of Two PURIFIERS, 25 ft. by 25 ft. by 5 ft., for their Gas-Works.

Drawings and Specifications can be seen on application to W. Prince, Engineer and Manager, Gas Offices, Wharf Street.

Sealed tenders are to be sent in, addressed to Councillor F. Geen, Chairman, Gas-Works, Stoke-upon-Trent, on or before Wednesday, the 13th day of November, 1895, endorsed on the outside "Tender for Purifiers."

The lowest or any tender not necessarily accepted.

By order,
J. B. ASHWELL,
Town Clerk.

ORIENTAL GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices of the Company, Finsbury House, Blomfield Street, London, E.C., on Wednesday, the 27th of November, 1895, at half-past Twelve o'clock precisely.

The Directors who retire are Messrs. N. E. B. Garey and H. D. Ellis; the Auditors, Messrs. Archibald Tennent Eastman and Samuel William Savage, also retire. All are eligible for re-election, and offer themselves accordingly.

By order of the Board,
H. J. LUFF,
Secretary.

Finsbury House, Blomfield Street,
London, E.C., Nov. 12, 1895.

N.B. — The TRANSFER BOOKS WILL BE CLOSED from the 13th of November to the 3rd of December, both days inclusive.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 5th inst.

The Right Hon. Sir JULIAN GOLDSMID, Bart., M.P., in the Chair, when the following RESOLUTIONS were unanimously passed:—

"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes."

"That a Dividend of 5 per cent. for the Half Year ended the 30th of June last, and a Bonus of £1 per cent. be declared upon the £3,800,000 Capital Stock of the Association, and that the same be payable, free of Income-Tax, on and after the 2nd of December next."

The Chairman having announced to the Meeting his resignation as Chairman and Director on account of ill-health, the following Resolution was unanimously passed:—

"That the sincere regret of the Shareholders be expressed to the Chairman on his resignation; and their cordial thanks be presented to him for his services in the past."

The cordial thanks of the Meeting were given to the Directors for their able management of the affairs of the Association, to the Chairman for his conduct in the Chair this day, to the Secretary and the London Staff, and to Mr. H. V. Lindon, the Agents, Engineers, and other Officers of the Association on the Continent.

By order of the Board,
G. F. THOMPSON,
Secretary.

21, Austin Friars, London, E.C.,
Nov. 6, 1895.

By Order of the Directors—1500 £10 Shares in the West Ham Gas Company.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Monday, Nov. 25, at Two o'clock, in lots, 1500 £10 SHARES in the above Undertaking, to be issued under the Provisions of the West Ham Gas Act, 1889; the Dividends rising or falling at the same rate as on the Original Shares of £5 each. The last Dividend on the Company's £10 Shares was at the rate of 6½ per cent. per annum.

Particulars of the SECRETARY of the Company, at the Offices, STRATFORD; of F. E. HILLEARY, Esq., Solicitor, 5, FENCHURCH BUILDINGS, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

SOUTH SHIELDS GAS COMPANY.

IMPORTANT SALE OF GAS STOCK.

MR. M. STAINTON is instructed by the Gas Company to SELL BY PUBLIC AUCTION, in the Board-Room, at the Gas Offices, Chapter Row, South Shields, on Monday, the 2nd of December, 1895, at One o'clock p.m., prompt, £10,000 of NEW STOCK under the South Shields Gas Act, 1886.

The Stock will be put up in Lots of £100 each, nominal value. A Deposit of £10 per cent. to be paid on the purchase-money at the Sale; the remainder to be paid on or before the 31st of December next.

If the Purchaser pays the full amount at the time of Sale, he will be entitled to Interest thereon at the rate of 3 per cent. per annum, up to, and payable on, the 31st of December, 1895.

The Stock will be registered in the name of the Purchaser, free of expense.

By order of the Directors,
J. H. PENNEY,
Secretary.

BROMLEY GAS CONSUMERS' COMPANY.

ISSUE OF THREE-AND-A-HALF PER CENT. DEBENTURE STOCK.

SALE BY TENDER.

MINIMUM PRICE, £105 PER CENT.

THE Directors invite Tenders for £18,000 of DEBENTURE STOCK, authorized to be raised under the Bromley Gas Act, 1879, which will bear a fixed and perpetual preferential rate of Interest of Three Pounds Ten Shillings per cent. per annum, payable Half Yearly (subject to Income-Tax). Allotments to the highest bidders.

Tenders must be delivered on or before Wednesday, the 20th of November, 1895.

Forms of Tender, with Particulars and Conditions, may be obtained, on application, from the Secretary, at the Company's Offices, the Works, Homesdale Road, Bromley, Kent; or from the Company's Bankers, Messrs. Robarts, Lubbock, and Co., 15, Lombard Street, London, E.C.; or from Messrs. Willett and Latter, Solicitors, Bromley, Kent.

By order of the Directors,
HENRY WILLIAM AMOS,
Secretary.

Bromley, Kent,
Oct. 28, 1895.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

ISSUE OF £30,000 NEW 5 PER CENT. PREFERENCE STOCK, CLASS E, BY PUBLIC TENDER.

THE Directors Hereby Give Notice, that in accordance with the Provisions of the South Staffordshire Water-Works Act, 1893, they are prepared to issue the above-mentioned amount of PREFERENCE STOCK in lots of £100 each.

The Holders of the Stock will be entitled to Dividend, payable Half Yearly, at the rate of, but not exceeding, 5 per cent. per annum out of the profits of the Undertaking in each Year. Tenders may be made for any number of lots of £100 each.

Forms of Tender may be obtained on application to the Secretary, at the Office of the Company, in Paradise Street, Birmingham, on and after Monday, the 11th day of November, 1895; and the latest day for the receipt of tenders is fixed for Monday, the 9th day of December, 1895.

Notices of Allotment will be sent out by the Company on or before Saturday, the 14th day of December, 1895; and the date for payment of the whole amount to the Company's Bankers is fixed for Wednesday, the 1st day of January, 1896, from which day the Stock will rank for Dividend.

The allotments will be made, and certificates will subsequently be issued, free of all expense to the allottees, who will thus acquire the Stock without payment for Stamps, Commission, or Fees of any kind.

By order,
H. HASELDEN,
Secretary.

Paradise Street, Birmingham,
Nov. 6, 1895.

BRISTOL WATER-WORKS COMPANY.

SALE OF STOCK.

ALEXANDER, DANIEL, SELFE, & CO. will SELL BY AUCTION at the Bank Auction Mart, Corn Street, Bristol, on Thursday, the 21st day of November, at TWO o'clock in the Afternoon,

£15,000

BRISTOL WATER-WORKS SEVEN PER CENT. MAXIMUM CONSOLIDATED ORDINARY STOCK,

in convenient Lots of £100 Stock and upwards.

The Dividend on this Stock is subject to a proportionate diminution whenever the Maximum Dividend to which each Class of Ordinary Shares or Stock of the Company is entitled shall not be paid up in full; but such diminution may be made up in subsequent years.

For further Particulars and Conditions of Sale, apply to the AUCTIONEERS, Bank Chambers, Corn Street, BRISTOL (and 84, Old Jewry, LONDON, E.C.); to Messrs. FUSSELL & Co., Solicitors, 36, Corn Street, BRISTOL; or to the BRISTOL WATER-WORKS COMPANY, Small Street, BRISTOL.

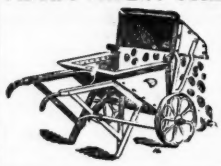
ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

GAS PURIFICATION.
Best Absorbent of Sulphuretted Hydrogen, &c.
JAMES E. CAMPBELL,
Patentee and Manufacturer,
96, MILL STREET, BRADFORD, MANCHESTER.

PRICES, &C., ON APPLICATION.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

THE DRUM
FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

ECONOMIZE £16 per RETORT per ANNUM by the USE of RETORTS of REDUCED THICKNESS fitted with

GUEGUEN'S COMPENSATING HELICOIDAL RIBS.

NO OUTLAY OF CAPITAL.
NO ALTERATION IN SETTINGS.
APPLICABLE TO ALL RETORTS.

J. LANS,
Engineer,
10, MOORGATE STREET, LONDON, E.C.

Inquiries from Retort Makers will be Esteemed.

A FREE TRIAL FOR ALL.
Agents Wanted.

HOLMSIDE GAS COALS.
PRESENT DAILY PRODUCE OVER 4000 TONS.
LATEST ANALYSIS:—

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.
PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.
RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash . . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

NOTICE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, Hereby Give Notice, that a Firm of F. J. Putz & Co., 16 and 17, Great St. Helen's, London, are advertising for sale Incandescent Gas-Light Apparatus called the "Champion" Incandescent Gas-Burner, and are stating in their circular that such Apparatus may be legally sold throughout the United Kingdom without Infringement of any existing Patent.

This is to Give Notice to the Public and the Trade that Actions for Infringement of Patent and for an Injunction will be immediately commenced by the Incandescent Gas-Light Company, Limited, against any persons using or selling such Apparatus.

The validity of the Company's Patents has already been certified by Mr. Justice Romer; and Solicitor and Client costs will be enforced in all cases.

FAITHFULL & OWEN,
11, Victoria Street, S.W.
Solicitors for the Incandescent Gas-Light Company, Limited.

NOTICE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

"The Incandescent Gas-Light Company Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo*, Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—

The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others*, the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.

(Signed) FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.

Limp Cloth. Price 6d.
ARCHITECTS AND SURVEYORS'
HANDBOOK OF GAS-FITTING.
(TABLES AND RULES BY ARTHUR H. CRUMP.)
JAMES STOTT AND CO., 174, Fleet Street, LONDON, E.C.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—		
Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY, LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF
NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

5, PRINCES STREET, PORT GLASGOW.

Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

KENT'S THICK GAS COAL

RAISED AT

The Wharncliffe Woodmoor Colliery,

BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power nearly* 17½ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1). .	1·276
Weight of One Cubic Foot. .	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter.	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash.	1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal .	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal . . .	1367 ,,
Coke	61·05 per cent.
Ash in Coke	8·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12·2 ,,

R. O. PATERSON, C.E.

Gas-Works, Cheltenham,
8th August, 1894.

For Price, &c., apply to the

Wharncliffe Woodmoor Colliery Co LIMITED,

BARNSLEY;

Or to Mr. W. H. HARVEY,

17, Old Queen Street, Westminster, S.W.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

London Office: R. Cull, 34, Old Broad St., E.C.

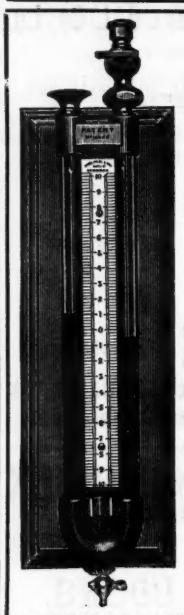
HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

THOMAS TURTON AND SONS, Limited,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, PANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.



MILNE'S PATENT HANDY PRESSURE-GAUGE.

By merely slackening a screw at the base, the Gauge can be taken to pieces. Can be jointed with either Asbestos, Leather, or Rubber.

JAMES MILNE & SON, LTD.,
EDINBURGH, & LEEDS,
LONDON, & GLASGOW.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
Coal Owners, Newcastle-on-Tyne
OR
E. FOSTER & CO.,
21, John Street, Adelphi, London, W.C.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

W. E. SANDER,
COMMISSION AGENT, BERLIN, 41, FRIEDRICH STR.

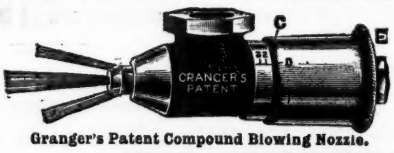
SPECIALITIES: Incandescent Lamp Burners and Mantles (with or without electric lighting from any distance, by button from the wall, etc.).

INCANDESCENT SPIRIT LAMPS.
Electro-technical Ware of all kinds.
IMPORT and EXPORT.

FORCED DRAUGHT
GRANGER'S FORCED DRAUGHT FURNACE

Can be applied to any type of Boiler, and Burns all kinds of Cheap Fuel, Slack, Smudge, Pan Breeze, &c., &c.—thus producing Steam at the lowest possible cost.

Overworked Boilers, or those having a poor natural Draught, give 15 to 30 per cent. more Steam when fitted with Granger's Forced Draught.



Granger's Patent Compound Blowing Nozzle.

Many hundreds working at the leading Collieries, Iron-Works, Mills, Factories, &c.

WM. GRANGER,
BROOKE ROAD, STOKE NEWINGTON, LONDON, N.
Telegrams: "NOZZLES, LONDON."

CRIPPS' PATENT VALVE FOR BY-PASSING PURIFYING MATERIAL IN PURIFIERS.

The PRESIDENT OF THE INSTITUTION OF GAS ENGINEERS, in his Address, stated—

"To overcome back-pressure, Mr. F. S. Cripps has designed a special form of Valve fixed in conjunction with each layer in Purifiers, and operated from outside the vessel. By this means, any tier can be by-passed as it is fouled, and free access given to the superposed one."

This Valve enables Purifiers to last much longer, without the cost of changing, by permitting the Gas to pass by the Lower Tiers when exhausted, and entering the Upper Tiers only; thus doing away with the heavy Back-Pressure of the Lower Tiers, and fully using up the unexhausted Material in the Upper Tiers.

Will save their Cost in Six Months **Can be fixed to Purifiers in use, as well as New Purifiers.**

Makers { **C. & W. WALKER,** Midland Iron-Works, Donnington, nr. Newport, Shropshire.
and **J. EVERY & SON,** Phœnix Iron-Works, Lewes, Sussex.

To whom all Inquiries should be addressed.

WILLEY & CO.,

GAS ENGINEERING CONTRACTORS,

EXETER,

For **GASHOLDERS** and all kinds of **ENGINEERING APPARATUS.**

For **WET** and **DRY GAS CONSUMERS' METERS.**

For **COIN METERS,** their Patent Automatic is admitted to be one of the best and most reliable in the Market. Largely used in the Metropolis.

For **GAS-FITTINGS,** Registered Designs in Extensive Variety.

Manufacturers of the **LIVESEY WASHER.**

Agents for the **MAXIM CARBURETTOR.**

New Works, 5 acres in extent, recently opened in the City of Exeter for the Manufacture of every kind of Apparatus used in the Production, Distribution, and Sale of Gas.

Telephone 132. Telegraphic Address: "Willey, Exeter."

ESTABLISHED 30 YEARS.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON OFFICE:
CXC	"JACKSON"	12, BURWOOD PLACE,
MARK.	CLAY CROSS.	W.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

GASEOUS FIRING A SPECIALTY.

Telegraphic Address: "DRAKESON, HALIFAX."

Telephone No. 43. HALIFAX EXCHANGE.

GAS ENGINEERS.
RETORT SETTERS.
IRONFOUNDERS.

CONTRACTORS.
FURNACE BUILDERS.
&c. &c.

SOLE MAKERS OF—
"MITTON'S"
PATENT SELF
—SEALING—
RETORT-LID.

JONAS DRAKE & SON

—SOLE AGENTS—
— For —
"HISLOP'S"
PATENT REGENERATIVE
— FURNACES. —
FOR ENGLAND, WALES & ABROAD.
OVENDEN, HALIFAX.

SOLE MAKERS OF—
"SETTLE'S"
PATENT COMBINED
SEAL-REGULATING
FLUSH-VALVE.

LONDON OFFICE:
60, QUEEN VICTORIA ST., E.C.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brussels	700,000 Cub. Ft.
Belfast	1,700,000 ,,	Liverpool	2,500,000 ,,
Glasgow	300,000 ,,	Tottenham	600,000 ,,
Santiago	400,000 ,,	Brighton	1,250,000 ,,

And have now under Contract:—

Belfast (Second Contract)	3,500,000 Cub. Ft.	Manchester	3,000,000 Cub. Ft.
Swansea	700,000 ,,	Bath	1,000,000 ,,
Preston	1,500,000 ,,	New York	1,000,000 ,,
Southport	750,000 ,,	Newburgh	350,000 ,,

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

9, Victoria Street, London, S.W. Telegrams: "EPISTOLARY, LONDON." *United States Office, 64, Broadway, New York.*

OIL GAS

BETTER TERMS CAN BE OBTAINED FROM SUPPLIERS OF OIL IF PURCHASERS HAVE THEIR OWN

TANK-WAGGONS.

HURST, NELSON, & Co., LTD.,

THE GLASGOW ROLLING STOCK AND PLANT WORKS, MOTHERWELL.

REGISTERED OFFICE:

27, ST. VINCENT PLACE, GLASGOW.

CUTLERS PATENT TUBULAR **GAS CONDENSER** SUITABLE FOR GASWORKS OF ALL SIZES, AND FOR ANY CLIMATE OVER **100** ERECTED

TANKS MAKERS OF **GASHOLDERS** OF EVERY SIZE AND TYPE ROOFS

HUNT'S **PATENT WASHER.** IS THE ONLY APPARATUS NECESSARY BETWEEN THE CONDENSER & PURIFIERS, IT REQUIRES NO MOTIVE POWER

TELEGRAMS "RETORTUS" LONDON

NATIONAL TELEPHONE 5059.

S. CUTLER & SONS, MILLWALL LONDON

A SPECIALTY **STEEL TANKS** FOR GASHOLDERS AND OIL STORAGE.

FOREIGN AGENTS. ELECTRIC FITTINGS

IMPROVED SYSTEM OF CARBURETTED **WATER-GAS PLANT** PARTICULARS ON APPLICATION.

COLONIAL AGENTS. DYNAMOS MOTORS.

CUTLER'S FREEZING PREVENTER IS THE **BEST** APPLIANCE FOR PREVENTING FORMATION OF ICE IN GASHOLDER CUPS. IT IS IN USE AT MANY IMPORTANT WORKS IN ENGLAND, GERMANY, AUSTRIA, AND AMERICA.

PETTIGREW'S PATENT

Sulphate of Ammonia Plant

ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

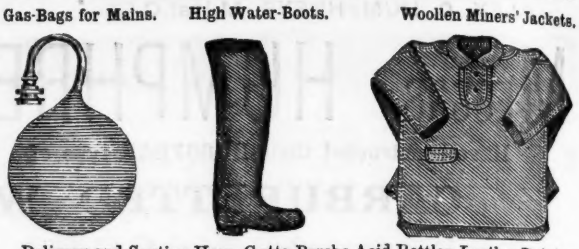
Write for Particulars, Testimonials, and References to

GEO. PETTIGREW & Co.,

GAS AND CHEMICAL ENGINEERS,

MIDDLESBROUGH-ON-TEES.

Gas-Bags for Mains. High Water-Boots. Woollen Miners' Jackets.



Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber. Stokers' Gloves, 14s. 6d. per dozen.

Write for Price List to

THOMAS BUGDEN, Manufacturer,

71, GOSWELL ROAD, LONDON, E.C.

CLAYTON SON & Co LTD

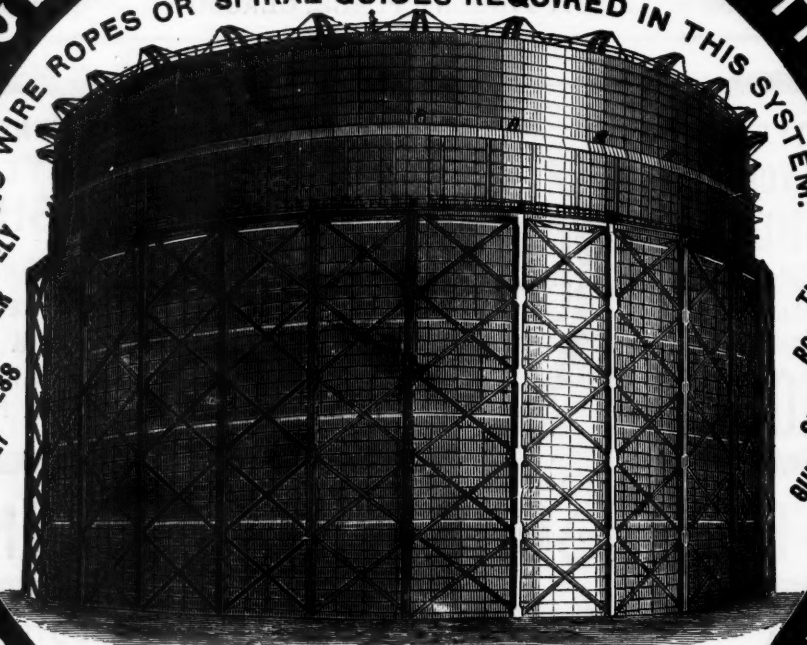
MAKERS OF

WORKS LEEDS

THE LARGEST GASHOLDER IN THE WORLD

GASHOLDERS OUR SPECIALITY

NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.



INFINITELY SAFER AND FAR LESS COSTLY THAN ROPES OR SPIRAL GUIDES.

CAPACITY 12 MILLION CUBIC FT.

ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR

MAKERS OF GAS PLANT OF EVERY DESCRIPTION ROOFS PURIFIERS &c. ALSO

ADDRESS LONDON 60, QUEEN VICTORIA ST. TELEGRAPHIC "GAS, LEEDS.

GASHOLDERS OF ANY SIZE

ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

STOURBRIDGE
RETORTS AND FIRE-BRICKS.
BEST QUALITY.

KING BROTHERS, STOURBRIDGE.

[See Illustrated Advertisement, Nov. 5, p. 945.]

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

OSLER,
BIRMINGHAM.

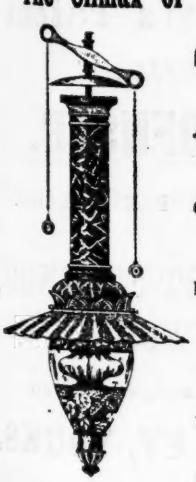
MANUFACTURERS
OF GASELIERS
IN GLASS AND METAL.

WILSON CARTER & PEARSON,
GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.
ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

ESTABLISHED 1861.

JOHN BROTHERTON, LIMITED,
IMPERIAL TUBE WORKS,
WOLVERHAMPTON,
MAKERS OF
TUBES AND FITTINGS
FOR EVERY PURPOSE.
PLEASE APPLY FOR LISTS. Telegrams: "IMPERIAL, WOLVERHAMPTON."

The Climax of Regenerative Gas Lighting!!



THE
"VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.

HENRY GREENE & SONS,
153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.
PARTICULARS AND PRICES FREE. AGENTS WANTED.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

[See Illustrated Advertisement, Nov. 5, p. 946.]

BEST & LLOYD
MAKERS OF THE BIRMINGHAM.

PATENT "SURPRISE" PENDANT,
WITH PATENT SHADE.

The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

Extract from the JOURNAL OF GAS LIGHTING, Jan. 8, 1895.

"IN CONJUNCTION WITH
THE INCANDESCENT GAS-LIGHT,
it quite **supersedes** the familiar three-light pendant. We are able to bear witness to the **convenience** of the New Pendant."

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

MOBBERLEY & PERRY

STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

Contractors for the erection of Retort-Benches complete.

London Agents:

BALE & HARDY, Gas Engineers and Contractors, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

CLAPHAM BROTHERS, LIMITED,

— ESTABLISHED 1837 —

LARGE REPEAT ORDERS

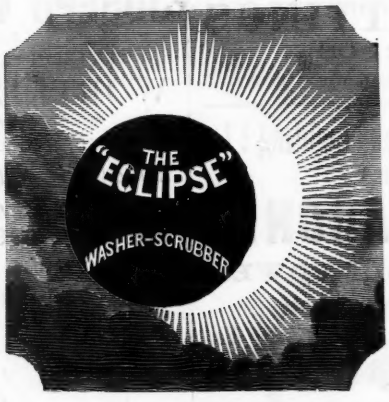
Have been received for

Laycock & Clapham's Patent

"ECLIPSE"

WASHER-SCRUBBERS.

Order Early.



GREAT SUCCESS

OF

Clapham's Patent

"ECLIPSE"

CONDENSER.

SEND FOR PARTICULARS.

CLAPHAM'S IMPROVED VALVES, PURIFIERS, AND RETORT-FITTINGS, MAINS, AND GENERAL CAST AND WROUGHT IRONWORK.

Catalogues, New Book of Testimonials, and full Particulars on Application.

Wellington, Nelson, and Market Street Works, KEIGHLEY, YORKS.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Nov. 12, 1895.